Getting ready for college math

In all the following $f = F'$ and $g = G'$.

1. **Product Rule .** Given F, f, G, g find $Fg + fG$

Example: If $F = (x^2+1)^3, G = (2x+7)^3, f = 3(x^2+1)^2, g = 6(2x+7)^2$
Find $Fg + fG$ and factor your answer completely.

2. Quotient Rule
Given F, f, G, g find $(F/G)' = \frac{fG-Fg}{G^2}$
Example: $F = (x^2+1)^m \quad G = (x^2+x)^n$
$f = 2mx(x^2+1)^{m-1} \quad g = 2n(x+1)(x^2+x)^{n-1}$.

3. Given $F(x)$ and $f(x) = F'(x)$. Find $F(a), F(b), f(a), f(b)$, and $\frac{F(b)-F(a)}{b-a}$.

4. Rewrite $\frac{x^n+1+x^m\sqrt{x}}{x^k}$ without radical signs.
Rewrite $\frac{x^n+1+x^m x^{\frac{1}{2}}}{x^k}$ without negative exponents .

5. Implicit differentiation :
Solve $3y^2D + y^3x = (x^2-1)D + x$ for D.

6. Given $F(x)$ and $f(x)$,
- Find equation of line through $(a, F(a))$ with slope $f(a)$.
- Solve $y - F(a) = f(a)(x-a)$ for y
- Solve $\frac{y-F(a)}{x-a} = f(a)$ for y.

7. a) Let $x = a$ and $x = b$ (with $a < b$) be the solutions of $u(x) = v(x)$. Find $F(b) - F(a)$.
b) Let $x = a$ and $x = b$ and $x = c$ (with $a < b < c$) be the solutions of $u(x) = v(x)$. Find $F(b) - F(a) + F(b) - F(c)$.

8. Given F,
simplify the difference quotient $\frac{F(a+h)-F(a)}{h}$

9. Given f (a first or second derivative)
a) Solve $f(x) = 0$.
b) In what intervals is $f(x)$ positive? negative?

10. Given F, find and simplify $\frac{F(b)-F(a)}{b-a}$

11. Suppose $F(x) = x^3 + bx^2 + cx + d$ and $f(x) = 3x^2 + 2bx + c$.
If $F(1) = 0$ and $F(2) = 4$ and $f(2) = 3$,
find $F(x), f(x), f(a)$, etc.

12. Order of operations problems such as
- $3x(x+1)^2 - x^2(3-2x)$.
- Given $f(x) = x+1$ and $g(x) = 2-x$ find $f(x) - 2g(x) - f(x)g(x)$.

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$ $\quad A^3(6B^2) + (3A^2)(B^3)$

Recognize as sum of two terms

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$. Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\left(2A^{3-2}B^2 + B^3\right)$
Pull out lowest common power B^2 of B	

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\,(2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\,\left(2A^{3-2} + B^{3-2}\right)$

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$. Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$. Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ \left(2A^{3-2}B^2 + B^3\right)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
This is the final answer	

Getting ready for college math

1. **Warmup for Product rule** Let $F = A^3$; $G = B^3$; $f = 3A^2$; and $g = 6B^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Scroll slowly. Try each step before you look at the answer.

Substitute the given polynomials into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ \left(2A^{3-2}B^2 + B^3\right)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
This is the final answer	$= 3A^2B^2(2A + B)$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$ $\quad (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$

Recognize as sum of two terms $=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ (2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3)$
Factor $(2x+7)^2$ from both terms.	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ (2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1 + (2x+7)^1\right)$

Preparation for Product rule Let $F=(x^2+1)^3$; $G=(2x+7)^3$; $f=3(x^2+1)^2$; and $g=6(2x+7)^2$. Find $Fg+fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg+fG$	$(x^2+1)^3(6(2x+7)^2)+(3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$=(x^2+1)^3(6(2x+7)^2)+(3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$=6(x^2+1)^3(2x+7)^2+3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$=3\left(2(x^2+1)^3(2x+7)^2+(x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$=3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2+(2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$=3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2}+(2x+7)^{3-2}\right)$
Subtract exponents	$=3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1+(2x+7)^1\right)$
Expand the remaining factor	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1 + (2x+7)^1\right)$
Expand the remaining factor	$= 3(x^2+1)^2(2x+7)^2\ \left((2x^2+2) + (2x+7)\right)$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1 + (2x+7)^1\right)$
Expand the remaining factor	$= 3(x^2+1)^2(2x+7)^2\ \left((2x^2+2) + (2x+7)\right)$
Collect the remaining factor	$=$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1 + (2x+7)^1\right)$
Expand the remaining factor	$= 3(x^2+1)^2(2x+7)^2\ \left((2x^2+2) + (2x+7)\right)$
Collect the remaining factor	$= \boxed{3(x^2+1)^2(2x+7)^2\ (2x^2+2x+9)}$

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ (2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1 + (2x+7)^1\right)$
Expand the remaining factor	$= 3(x^2+1)^2(2x+7)^2\ \left((2x^2+2) + (2x+7)\right)$
Collect the remaining factor	$= \boxed{3(x^2+1)^2(2x+7)^2\ (2x^2+2x+9)}$

To be sure the boxed answer is completely factored, use the Quadratic polynomial factoring criterion to see if $2x^2 + 2x + 9$ factors.

Preparation for Product rule Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: This problem was obtained by substituting x^2+1 for A and $2x+7$ for B in the warmup problem. This problem seems harder, simply because there are more symbols.

Substitute the given polynomials into $Fg + fG$	$(x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Recognize as sum of two terms	$= (x^2+1)^3(6(2x+7)^2) + (3(x^2+1)^2)((2x+7)^3)$
Rewrite each term with constant at left	$= 6(x^2+1)^3(2x+7)^2 + 3(x^2+1)^2(2x+7)^3$
Factor out common factor 3	$= 3\left(2(x^2+1)^3(2x+7)^2 + (x^2+1)^2(2x+7)^3\right)$
Factor $(x^2+1)^2$ from both terms.	$= 3(x^2+1)^2\ \left(2(x^2+1)^{3-2}(2x+7)^2 + (2x+7)^3\right)$
Factor $(2x+7)^2$ from both terms.	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^{3-2} + (2x+7)^{3-2}\right)$
Subtract exponents	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1)^1 + (2x+7)^1\right)$
Expand the remaining factor	$= 3(x^2+1)^2(2x+7)^2\ \left((2x^2+2) + (2x+7)\right)$
Collect the remaining factor	$= \boxed{3(x^2+1)^2(2x+7)^2\ (2x^2+2x+9)}$

To be sure the boxed answer is completely factored, use the Quadratic polynomial factoring criterion to see if $2x^2+2x+9$ factors. It does not because $b^2 - 4ac = 2^2 - 4\cdot 2\cdot 9 = 4 - 72 = -68$ is not a perfect square.

This problem was a bit much. On the next slide, we show how to use abbreviations to make it easier to handle.

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$. Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$ $\quad A^3(6B^2) + (3A^2)(B^3)$

Recognize as sum of two terms $\quad =$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\left(2A^{3-2}B^2 + B^3\right)$
Pull out lowest common power B^2 of B	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$=$

Using abbreviations Let $F=(x^2+1)^3$; $G=(2x+7)^3$; $f=3(x^2+1)^2$; and $g=6(2x+7)^2$.
Find $Fg+fG$ and factor your answer completely.

Solution: Substitute $A=x^2+1$ and $B=2x+7$ in F,g,f,G to get $F=A^3, G=B^3, f=3A^2, g=6B^2$.

Substitute the abbreviations into $Fg+fG$	$A^3(6B^2)+(3A^2)(B^3)$
Recognize as sum of two terms	$=A^3(6B^2)+(3A^2)(B^3)$
Rewrite each term with constant at left	$=6A^3B^2+3A^2B^3$
Pull out common factor 3	$=3\left(2A^3B^2+A^2B^3\right)$
Pull out the lowest common power A^2 of A	$=3A^2\ (2A^{3-2}B^2+B^3)$
Pull out lowest common power B^2 of B	$=3A^2B^2\ \left(2A^{3-2}+B^{3-2}\right)$
Subtract exponents	$=3A^2B^2\ \left(2A^1+B^1\right)$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$= 3A^2B^2(2A + B)$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$= 3A^2B^2(2A + B)$
Substitute $A = x^2+1$ and $B = 2x+7$ in this answer	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$= 3A^2B^2(2A + B)$
Substitute $A = x^2+1$ and $B = 2x+7$ in this answer	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1) + (2x+7)\right)$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$= 3A^2B^2(2A + B)$
Substitute $A = x^2+1$ and $B = 2x+7$ in this answer	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1) + (2x+7)\right)$
Collect the remaining factor	$=$

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2 + 1$ and $B = 2x + 7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$= 3A^2B^2(2A + B)$
Substitute $A = x^2 + 1$ and $B = 2x + 7$ in this answer	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1) + (2x+7)\right)$
Collect the remaining factor	$= \boxed{3(x^2+1)^2(2x+7)^2\ (2x^2+2x+9)}$

In calculus, some expression names are written with a prime. For example, f and f' could be the names of different polynomials, as in the next example.

Using abbreviations Let $F = (x^2+1)^3$; $G = (2x+7)^3$; $f = 3(x^2+1)^2$; and $g = 6(2x+7)^2$.
Find $Fg + fG$ and factor your answer completely.

Solution: Substitute $A = x^2+1$ and $B = 2x+7$ in F, g, f, G to get $F = A^3, G = B^3, f = 3A^2, g = 6B^2$.

Substitute the abbreviations into $Fg + fG$	$A^3(6B^2) + (3A^2)(B^3)$
Recognize as sum of two terms	$= A^3(6B^2) + (3A^2)(B^3)$
Rewrite each term with constant at left	$= 6A^3B^2 + 3A^2B^3$
Pull out common factor 3	$= 3\left(2A^3B^2 + A^2B^3\right)$
Pull out the lowest common power A^2 of A	$= 3A^2\ (2A^{3-2}B^2 + B^3)$
Pull out lowest common power B^2 of B	$= 3A^2B^2\ \left(2A^{3-2} + B^{3-2}\right)$
Subtract exponents	$= 3A^2B^2\ \left(2A^1 + B^1\right)$
Then $Fg + fG$, in terms of A and B is	$= 3A^2B^2(2A+B)$
Substitute $A = x^2+1$ and $B = 2x+7$ in this answer	$= 3(x^2+1)^2(2x+7)^2\ \left(2(x^2+1) + (2x+7)\right)$
Collect the remaining factor	$= \boxed{3(x^2+1)^2(2x+7)^2\ (2x^2+2x+9)}$

In calculus, some expression names are written with a prime. For example, f and f' could be the names of different polynomials, as in the next example.

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g - fg'}{g^2}$

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $= \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $= \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $= \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $= \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $= \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{\cancel{2}\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{\cancel{4}(2x+7)^6}$

1. **Preparation for Quotient rule:** Let $f=(x^2+1)^4$; $g=2(2x+7)^3$, $f'=8x(x^2+1)^3$, and $g'=6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{\not{2}\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{\not{4}(2x+7)^6}$

Pull out least power $(x^2+1)^3$ of x^2+1 from both terms.

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{\cancel{2}\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{\cancel{4}(2x+7)^6}$

Pull out least power $(x^2+1)^3$ of x^2+1 from both terms. $\quad = \frac{(x^2+1)^3\left(8x(2x+7)^3-(x^2+1)(3(2x+7)^2)\right)}{2(2x+7)^6}$

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{\cancel{2}\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{\cancel{4}(2x+7)^6}$

Pull out least power $(x^2+1)^3$ of x^2+1 from both terms. $\quad = \frac{(x^2+1)^3\left(8x(2x+7)^3-(x^2+1)(3(2x+7)^2)\right)}{2(2x+7)^6}$

Pull out least power $(2x+7)^2$ of $2x+7$ from both terms. $\quad = \frac{(x^2+1)^3(2x+7)^2\left(8x(2x+7)-(x^2+1)(3)\right)}{2(2x+7)^6}$

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{\cancel{2}\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{\cancel{4}(2x+7)^6}$

Pull out least power $(x^2+1)^3$ of x^2+1 from both terms. $\quad = \frac{(x^2+1)^3\left(8x(2x+7)^3-(x^2+1)(3(2x+7)^2)\right)}{2(2x+7)^6}$

Pull out least power $(2x+7)^2$ of $2x+7$ from both terms. $\quad = \frac{(x^2+1)^3(2x+7)^2\left(8x(2x+7)-(x^2+1)(3)\right)}{2(2x+7)^6}$

Cancel powers of $2x+7$ and rewrite the remaining factor $\quad = \frac{(x^2+1)^3\cancel{(2x+7)^2}(16x^2+56x-(3x^2+3))}{2\cancel{(2x+7)^6}}$

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{4(2x+7)^6}$

Pull out least power $(x^2+1)^3$ of x^2+1 from both terms. $\quad = \frac{(x^2+1)^3\left(8x(2x+7)^3-(x^2+1)(3(2x+7)^2)\right)}{2(2x+7)^6}$

Pull out least power $(2x+7)^2$ of $2x+7$ from both terms. $\quad = \frac{(x^2+1)^3(2x+7)^2\left(8x(2x+7)-(x^2+1)(3)\right)}{2(2x+7)^6}$

Cancel powers of $2x+7$ and rewrite the remaining factor $\quad = \frac{(x^2+1)^3(2x+7)^2(16x^2+56x-(3x^2+3))}{2(2x+7)^6}$

Distribute the minus sign $\quad = \frac{(x^2+1)^3(16x^2+56x-3x^2-3)}{2(2x+7)^{6-2}}$

1. **Preparation for Quotient rule:** Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Substitute the given polynomials into $\frac{f'g-fg'}{g^2}$ $\quad \frac{(8x(x^2+1)^3)(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Recognize as sum of two terms $\quad = \frac{8x(x^2+1)^3(2(2x+7)^3)-(x^2+1)^4(6(2x+7)^2)}{(2(2x+7)^3)^2}$

Rewrite each term with constant at left $\quad = \frac{16x(x^2+1)^3(2x+7)^3-6(x^2+1)^4(2x+7)^2}{2^2((2x+7)^3)^2}$

Pull out common factor 2 from numerator $\quad = \frac{2\left(8x(x^2+1)^3(2x+7)^3-3(x^2+1)^4((2x+7)^2)\right)}{4(2x+7)^6}$

Cancel constant factor from numerator and denominator $\quad = \frac{\cancel{2}\left(8x(x^2+1)^3(2x+7)^3-(x^2+1)^4(3(2x+7)^2)\right)}{\cancel{4}(2x+7)^6}$

Pull out least power $(x^2+1)^3$ of x^2+1 from both terms. $\quad = \frac{(x^2+1)^3\left(8x(2x+7)^3-(x^2+1)(3(2x+7)^2)\right)}{2(2x+7)^6}$

Pull out least power $(2x+7)^2$ of $2x+7$ from both terms. $\quad = \frac{(x^2+1)^3(2x+7)^2\left(8x(2x+7)-(x^2+1)(3)\right)}{2(2x+7)^6}$

Cancel powers of $2x+7$ and rewrite the remaining factor $\quad = \frac{(x^2+1)^3\cancel{(2x+7)^2}(16x^2+56x-(3x^2+3))}{2\cancel{(2x+7)^6}}$

Distribute the minus sign $\quad = \frac{(x^2+1)^3(16x^2+56x-3x^2-3)}{2(2x+7)^{6-2}}$

Collect the remaining factor $\quad = \boxed{\frac{(x^2+1)^3(13x^2+56x-3)}{2(2x+7)^4}}$

Note: the Quadratic polynomial factoring criterion assures us that $13x^2+56x-3$ does not factor because $b^2-4ac = 56^2-4(13)(-3) = 3292$ is not a perfect square.

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Working with abbreviations: Let $f = (x^2+1)^4; \quad g = 2(2x+7)^3, \quad f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$.
Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4; \quad g = B^3, \quad f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g - fg'}{g^2}$

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$ $\frac{(8xA^3 \cdot 2B^3) - A^4(6B^2)}{(2B^3)^2}$

Recognize as sum of two terms

Working with abbreviations: Let $f = (x^2+1)^4; \quad g = 2(2x+7)^3, \quad f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$.
Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4; \quad g = B^3, \quad f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g - fg'}{g^2}$ $\quad \frac{(8xA^3 \cdot 2B^3) - A^4(6B^2)}{(2B^3)^2}$

Recognize as sum of two terms $\quad = \frac{8xA^3 \cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$

Rewrite each term with constant at left

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$.
Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.
Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3 \cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$= \frac{8xA^3 \cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$= \frac{16xA^3B^3 - 6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$.
Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.
Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3 \cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$= \frac{8xA^3 \cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$= \frac{16xA^3B^3 - 6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$= \frac{2(8xA^3B^3 - 3A^4B^2)}{4B^6}$

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3\cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$= \frac{8xA^3\cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$= \frac{16xA^3B^3 - 6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$= \frac{2(8xA^3B^3 - 3A^4B^2)}{4B^6}$
Cancel before continuing	

Working with abbreviations: Let $f=(x^2+1)^4;\quad g=2(2x+7)^3,\quad f'=8x(x^2+1)^3$, and $g'=6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f=A^4;\quad g=B^3,\quad f'=8xA^3$, and $g'=6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3\cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$=\frac{8xA^3\cdot 2B^3-A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$=\frac{16xA^3B^3-6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$=\frac{2(8xA^3B^3-3A^4B^2)}{4B^6}$
Cancel before continuing	$=\frac{\cancel{2}(8xA^3B^3-3A^4B^2)}{\cancel{4}B^6}=\frac{(8xA^3B^3-3A^4B^2)}{2B^6}$

Working with abbreviations: Let $f=(x^2+1)^4$; $g=2(2x+7)^3$, $f'=8x(x^2+1)^3$, and $g'=6(2x+7)^2$.
Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.
Solution: Scroll slowly. Try each step in the left column before you click to see the answer.
Substitute A for x^2+1 and B for $2x+7$ to get $f=A^4$; $g=B^3$, $f'=8xA^3$, and $g'=6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3\cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$=\frac{8xA^3\cdot 2B^3-A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$=\frac{16xA^3B^3-6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$=\frac{2(8xA^3B^3-3A^4B^2)}{4B^6}$
Cancel before continuing	$=\frac{\cancel{2}(8xA^3B^3-3A^4B^2)}{\cancel{4}B^6}=\frac{(8xA^3B^3-3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g - fg'}{g^2}$	$\frac{(8xA^3 \cdot 2B^3) - A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$= \frac{8xA^3 \cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$= \frac{16xA^3B^3 - 6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$= \frac{2(8xA^3B^3 - 3A^4B^2)}{4B^6}$
Cancel before continuing	$= \frac{\not{2}(8xA^3B^3 - 3A^4B^2)}{\not{4}B^6} = \frac{(8xA^3B^3 - 3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	$= \frac{A^3(8xB^3 - 3A^{4-3}B^2)}{2B^6} = \frac{A^3(8xB^3 - 3AB^2)}{2B^6}$

Working with abbreviations: Let $f=(x^2+1)^4$; $g=2(2x+7)^3$, $f'=8x(x^2+1)^3$, and $g'=6(2x+7)^2$. Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f=A^4$; $g=B^3$, $f'=8xA^3$, and $g'=6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3\cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$=\frac{8xA^3\cdot 2B^3-A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$=\frac{16xA^3B^3-6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$=\frac{2(8xA^3B^3-3A^4B^2)}{4B^6}$
Cancel before continuing	$=\frac{\cancel{2}(8xA^3B^3-3A^4B^2)}{\cancel{4}B^6}=\frac{(8xA^3B^3-3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	$=\frac{A^3(8xB^3-3A^{4-3}B^2)}{2B^6}=\frac{A^3(8xB^3-3AB^2)}{2B^6}$
Pull out lowest common power B^2 of B	$=\frac{A^3B^2(8xB^{3-2}-3A)}{2B^6}=\frac{A^3B^2(8xB-3A)}{2B^6}$

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$.
Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3 \cdot 2B^3) - A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$= \frac{8xA^3 \cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$= \frac{16xA^3B^3 - 6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$= \frac{2(8xA^3B^3 - 3A^4B^2)}{4B^6}$
Cancel before continuing	$= \frac{\not{2}(8xA^3B^3 - 3A^4B^2)}{\not{4}B^6} = \frac{(8xA^3B^3 - 3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	$= \frac{A^3(8xB^3 - 3A^{4-3}B^2)}{2B^6} = \frac{A^3(8xB^3 - 3AB^2)}{2B^6}$
Pull out lowest common power B^2 of B	$= \frac{A^3B^2(8xB^{3-2} - 3A)}{2B^6} = \frac{A^3B^2(8xB - 3A)}{2B^6}$
Cancel common power of B	$= \frac{A^3\not{B}^2(8xB - 3A)}{2\not{B}^6} = \frac{A^3(8xB - 3A)}{2B^4}$

Working with abbreviations: Let $f=(x^2+1)^4; \quad g=2(2x+7)^3, \quad f'=8x(x^2+1)^3$, and $g'=6(2x+7)^2$.
Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.
Solution: Scroll slowly. Try each step in the left column before you click to see the answer.
Substitute A for x^2+1 and B for $2x+7$ to get $f=A^4; \quad g=B^3, \quad f'=8xA^3$, and $g'=6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3\cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$=\frac{8xA^3\cdot 2B^3-A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$=\frac{16xA^3B^3-6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$=\frac{2(8xA^3B^3-3A^4B^2)}{4B^6}$
Cancel before continuing	$=\frac{\cancel{2}(8xA^3B^3-3A^4B^2)}{\cancel{4}B^6}=\frac{(8xA^3B^3-3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	$=\frac{A^3(8xB^3-3A^{4-3}B^2)}{2B^6}=\frac{A^3(8xB^3-3AB^2)}{2B^6}$
Pull out lowest common power B^2 of B	$=\frac{A^3B^2(8xB^{3-2}-3A)}{2B^6}=\frac{A^3B^2(8xB-3A)}{2B^6}$
Cancel common power of B	$=\frac{A^3\cancel{B^2}(8xB-3A)}{2\cancel{B^6}}=\frac{A^3(8xB-3A)}{2B^4}$
Go back to x	$=\frac{(x^2+1)^3(8x(2x+7)-3(x^2+1))}{2(2x+7)^4}$

Working with abbreviations: Let $f = (x^2+1)^4$; $g = 2(2x+7)^3$, $f' = 8x(x^2+1)^3$, and $g' = 6(2x+7)^2$. Find $\frac{f'g - fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.

Solution: Scroll slowly. Try each step in the left column before you click to see the answer.

Substitute A for x^2+1 and B for $2x+7$ to get $f = A^4$; $g = B^3$, $f' = 8xA^3$, and $g' = 6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3 \cdot 2B^3) - A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$= \frac{8xA^3 \cdot 2B^3 - A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$= \frac{16xA^3B^3 - 6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$= \frac{2(8xA^3B^3 - 3A^4B^2)}{4B^6}$
Cancel before continuing	$= \frac{\cancel{2}(8xA^3B^3 - 3A^4B^2)}{\cancel{4}B^6} = \frac{(8xA^3B^3 - 3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	$= \frac{A^3(8xB^3 - 3A^{4-3}B^2)}{2B^6} = \frac{A^3(8xB^3 - 3AB^2)}{2B^6}$
Pull out lowest common power B^2 of B	$= \frac{A^3B^2(8xB^{3-2} - 3A)}{2B^6} = \frac{A^3B^2(8xB - 3A)}{2B^6}$
Cancel common power of B	$= \frac{A^3\cancel{B^2}(8xB - 3A)}{2\cancel{B^6}} = \frac{A^3(8xB - 3A)}{2B^4}$
Go back to x	$= \frac{(x^2+1)^3(8x(2x+7) - 3(x^2+1))}{2(2x+7)^4}$
Expand remaining factor	$= \frac{(x^2+1)^3(16x^2+56x-3x^2-3)}{2(2x+7)^4} = \boxed{\frac{(x^2+1)^3(13x^2+56x-3)}{2(2x+7)^4}}$

Working with abbreviations: Let $f=(x^2+1)^4;\quad g=2(2x+7)^3,\quad f'=8x(x^2+1)^3$, and $g'=6(2x+7)^2$.
Find $\frac{f'g-fg'}{g^2}$ and rewrite your answer as a completely reduced fraction.
Solution: Scroll slowly. Try each step in the left column before you click to see the answer.
Substitute A for x^2+1 and B for $2x+7$ to get $f=A^4;\quad g=B^3,\quad f'=8xA^3$, and $g'=6B^2$.

Substitute into $\frac{f'g-fg'}{g^2}$	$\frac{(8xA^3\cdot 2B^3)-A^4(6B^2)}{(2B^3)^2}$
Recognize as sum of two terms	$=\frac{8xA^3\cdot 2B^3-A^4(6B^2)}{(2B^3)^2}$
Rewrite each term with constant at left	$=\frac{16xA^3B^3-6A^4B^2}{2^2(B^3)^2}$
Pull out common factor 2 from numerator	$=\frac{2(8xA^3B^3-3A^4B^2)}{4B^6}$
Cancel before continuing	$=\frac{\not{2}(8xA^3B^3-3A^4B^2)}{\not{4}B^6}=\frac{(8xA^3B^3-3A^4B^2)}{2B^6}$
Pull out lowest common power A^3 of A	$=\frac{A^3(8xB^3-3A^{4-3}B^2)}{2B^6}=\frac{A^3(8xB^3-3AB^2)}{2B^6}$
Pull out lowest common power B^2 of B	$=\frac{A^3B^2(8xB^{3-2}-3A)}{2B^6}=\frac{A^3B^2(8xB-3A)}{2B^6}$
Cancel common power of B	$=\frac{A^3\not{B}^2(8xB-3A)}{2\not{B}^6}=\frac{A^3(8xB-3A)}{2B^4}$
Go back to x	$=\frac{(x^2+1)^3(8x(2x+7)-3(x^2+1))}{2(2x+7)^4}$
Expand remaining factor	$=\frac{(x^2+1)^3(16x^2+56x-3x^2-3)}{2(2x+7)^4}=\boxed{\frac{(x^2+1)^3(13x^2+56x-3)}{2(2x+7)^4}}$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$\frac{f(b)-f(a)}{b-a}$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then
$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x}$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then
$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then
$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$
$= \frac{-1}{h}\left((x-h)-(x-h)^2 - (x-x^2)\right)$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$$

$$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$
$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$
$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$
$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$
$$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$$
$$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$$
$$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$$

$$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$$

$$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a}$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$

$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$

$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$

$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$

$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$

$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$

$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x}$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$

$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$

$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$

$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$

$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$

$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$

$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h)-(x-h)^2-(x-x^2)\right)$$

$$= -\frac{1}{h}\left(x-h-(x^2-2hx+h^2)-x+x^2\right)$$

$$= -\frac{1}{h}\left(x-h-x^2+2hx-h^2-x+x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x}-h\cancel{-x^2}+2hx-h^2\cancel{-x}\cancel{+x^2}\right)$$

$$= -\frac{1}{h}\left(-h+2hx-h^2\right)$$

$$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1+2x-h)\right) = \boxed{-2x+1+h}$$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left((x+h)-(x+h)^2-(x-x^2)\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$

$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$

$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$

$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$

$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$

$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$

$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$

$= \frac{1}{h}\left((x+h) - (x+h)^2 - (x - x^2)\right)$

$= \frac{1}{h}\left(x + h - (x^2 + 2hx + h^2) - x + x^2\right)$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x} - h \cancel{- x^2} + 2hx - h^2 \cancel{- x} \cancel{+ x^2}\right)$$

$$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$$

$$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left((x+h) - (x+h)^2 - (x - x^2)\right)$$

$$= \frac{1}{h}\left(x + h - (x^2 + 2hx + h^2) - x + x^2\right)$$

$$= \frac{1}{h}\left(x + h - x^2 - 2hx - h^2 - x + x^2\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h)-(x-h)^2-(x-x^2)\right)$$

$$= -\frac{1}{h}\left(x-h-(x^2-2hx+h^2)-x+x^2\right)$$

$$= -\frac{1}{h}\left(x-h-x^2+2hx-h^2-x+x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x}-h\cancel{-x^2}+2hx-h^2\cancel{-x}\cancel{+x^2}\right)$$

$$= -\frac{1}{h}\left(-h+2hx-h^2\right)$$

$$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1+2x-h)\right) = \boxed{-2x+1+h}$$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left((x+h)-(x+h)^2-(x-x^2)\right)$$

$$= \frac{1}{h}\left(x+h-(x^2+2hx+h^2)-x+x^2\right)$$

$$= \frac{1}{h}\left(x+h-x^2-2hx-h^2-x+x^2\right)$$

$$= \frac{1}{h}\left(\cancel{x}+h\cancel{-x^2}-2hx-h^2\cancel{-x}\cancel{+x^2}\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h) - (x-h)^2 - (x - x^2)\right)$$

$$= -\frac{1}{h}\left(x - h - (x^2 - 2hx + h^2) - x + x^2\right)$$

$$= -\frac{1}{h}\left(x - h - x^2 + 2hx - h^2 - x + x^2\right)$$

$$= -\frac{1}{h}\left(\not{x} - h \not{-x^2} + 2hx - h^2 \not{-x} \not{+x^2}\right)$$

$$= -\frac{1}{h}\left(-h + 2hx - h^2\right)$$

$$= -\frac{1}{\not{h}}\left(\not{h}(-1 + 2x - h)\right) = \boxed{-2x + 1 + h}$$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left((x+h) - (x+h)^2 - (x - x^2)\right)$$

$$= \frac{1}{h}\left(x + h - (x^2 + 2hx + h^2) - x + x^2\right)$$

$$= \frac{1}{h}\left(x + h - x^2 - 2hx - h^2 - x + x^2\right)$$

$$= \frac{1}{h}\left(\not{x} + h \not{-x^2} - 2hx - h^2 \not{-x} \not{+x^2}\right)$$

$$= \frac{1}{h}\left(h - 2hx - h^2\right)$$

3. In each of the following, find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.1 Let $f(x) = x - x^2; a = x, b = x - h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x-h)-f(x)}{(x-h)-x} = \frac{f(x-h)-f(x)}{-h}$$

$$= \frac{-1}{h}\left((x-h)-(x-h)^2-(x-x^2)\right)$$

$$= -\frac{1}{h}\left(x-h-(x^2-2hx+h^2)-x+x^2\right)$$

$$= -\frac{1}{h}\left(x-h-x^2+2hx-h^2-x+x^2\right)$$

$$= -\frac{1}{h}\left(\cancel{x}-h\cancel{-x^2}+2hx-h^2\cancel{-x}\cancel{+x^2}\right)$$

$$= -\frac{1}{h}\left(-h+2hx-h^2\right)$$

$$= -\frac{1}{\cancel{h}}\left(\cancel{h}(-1+2x-h)\right) = \boxed{-2x+1+h}$$

3.2 Let $f(x) = x - x^2; a = x; b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left((x+h)-(x+h)^2-(x-x^2)\right)$$

$$= \frac{1}{h}\left(x+h-(x^2+2hx+h^2)-x+x^2\right)$$

$$= \frac{1}{h}\left(x+h-x^2-2hx-h^2-x+x^2\right)$$

$$= \frac{1}{h}\left(\cancel{x}+h\cancel{-x^2}-2hx-h^2\cancel{-x}\cancel{+x^2}\right)$$

$$= \frac{1}{h}\left(h-2hx-h^2\right)$$

$$= \frac{1}{\cancel{h}}\left(\cancel{h}(1-2x-h)\right) = \boxed{-2x+1-h}$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} =$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x}$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$

$=$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$

$= \frac{1}{h}\left(f(x+h) - f(x)\right)$

$=$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h}\cdot\frac{x}{x} - \frac{1}{x}\cdot\frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h}\cdot\frac{x-x-h}{x(x+h)}$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h} \cdot \frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\not h} \cdot \frac{-\not h}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} =$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h} \cdot \frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\cancel{h}} \cdot \frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x}$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h} \cdot \frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\cancel{h}} \cdot \frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$=$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h} \cdot \frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\cancel{h}} \cdot \frac{\cancel{-h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h}\cdot\frac{x}{x} - \frac{1}{x}\cdot\frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h}\cdot\frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\cancel{h}}\cdot\frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} - \frac{x}{2x+3}\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} \cdot \frac{x}{x} - \frac{1}{x} \cdot \frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h} \cdot \frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\cancel{h}} \cdot \frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} - \frac{x}{2x+3}\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} \cdot \frac{2x+3}{2x+3} - \frac{x}{2x+3} \cdot \frac{2x+2h+3}{2x+2h+3}\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h}\cdot\frac{x}{x} - \frac{1}{x}\cdot\frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h}\cdot\frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{\cancel{h}}\cdot\frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} - \frac{x}{2x+3}\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3}\cdot\frac{2x+3}{2x+3} - \frac{x}{2x+3}\cdot\frac{2x+2h+3}{2x+2h+3}\right)$$

$$= \frac{1}{h}\left(\frac{x(2x)+x(3)+h(2x)+h(3)}{(2x+3+2h)(2x+3)} - \frac{x(2x)+x(2h)+x(3)}{(2x+3+2h)(2x+3)}\right)$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}$; $a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$
$$= \frac{1}{h}\left(\frac{1}{x+h}\cdot\frac{x}{x} - \frac{1}{x}\cdot\frac{x+h}{x+h}\right)$$
$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$
$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h}\cdot\frac{x-x-h}{x(x+h)}$$
$$= \frac{1}{\cancel{h}}\cdot\frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}$; $a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} - \frac{x}{2x+3}\right)$$
$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3}\cdot\frac{2x+3}{2x+3} - \frac{x}{2x+3}\cdot\frac{2x+2h+3}{2x+2h+3}\right)$$
$$= \frac{1}{h}\left(\frac{x(2x)+x(3)+h(2x)+h(3)}{(2x+3+2h)(2x+3)} - \frac{x(2x)+x(2h)+x(3)}{(2x+3+2h)(2x+3)}\right)$$
$$= \frac{2x^2+3x+2hx+3h-(2x^2+2xh+3x)}{h(2x+3+2h)(2x+3)}$$
$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$

$$= \frac{1}{h}\left(\frac{1}{x+h}\cdot\frac{x}{x} - \frac{1}{x}\cdot\frac{x+h}{x+h}\right)$$

$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$

$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h}\cdot\frac{x-x-h}{x(x+h)}$$

$$= \frac{1}{h}\cdot\frac{-h}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} - \frac{x}{2x+3}\right)$$

$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3}\cdot\frac{2x+3}{2x+3} - \frac{x}{2x+3}\cdot\frac{2x+2h+3}{2x+2h+3}\right)$$

$$= \frac{1}{h}\left(\frac{x(2x)+x(3)+h(2x)+h(3)}{(2x+3+2h)(2x+3)} - \frac{x(2x)+x(2h)+x(3)}{(2x+3+2h)(2x+3)}\right)$$

$$= \frac{2x^2+3x+2hx+3h-(2x^2+2xh+3x)}{h(2x+3+2h)(2x+3)}$$

$$= \frac{2x^2+3x+2xh+3h-2x^2-2xh-3x}{h(2x+3+2h)(2x+3)}$$

$$=$$

3 Find $\frac{f(b)-f(a)}{b-a}$ and rewrite your answer as a polynomial or as a reduced fraction. Go slowly through the slide and write down the answer to each part before you move ahead.

3.3 Let $f(x) = \frac{1}{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{1}{h}\left(\frac{1}{x+h} - \frac{1}{x}\right)$$
$$= \frac{1}{h}\left(\frac{1}{x+h}\cdot\frac{x}{x} - \frac{1}{x}\cdot\frac{x+h}{x+h}\right)$$
$$= \frac{1}{h}\left(\frac{x}{(x+h)x} - \frac{x+h}{x(x+h)}\right)$$
$$= \frac{1}{h}\left(\frac{x-(x+h)}{x(x+h)}\right) = \frac{1}{h}\cdot\frac{x-x-h}{x(x+h)}$$
$$= \frac{1}{\cancel{h}}\cdot\frac{-\cancel{h}}{x(x+h)} = \boxed{\frac{-1}{x(x+h)}}$$

3.4 Let $f(x) = \frac{x}{2x+3}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3} - \frac{x}{2x+3}\right)$$
$$= \frac{1}{h}\left(\frac{x+h}{2x+2h+3}\cdot\frac{2x+3}{2x+3} - \frac{x}{2x+3}\cdot\frac{2x+2h+3}{2x+2h+3}\right)$$
$$= \frac{1}{h}\left(\frac{x(2x)+x(3)+h(2x)+h(3)}{(2x+3+2h)(2x+3)} - \frac{x(2x)+x(2h)+x(3)}{(2x+3+2h)(2x+3)}\right)$$
$$= \frac{2x^2+3x+2hx+3h-(2x^2+2xh+3x)}{h(2x+3+2h)(2x+3)}$$
$$= \frac{\cancel{2x^2}+\cancel{3x}+\cancel{2xh}+3h-\cancel{2x^2}-\cancel{2xh}-\cancel{3x}}{h(2x+3+2h)(2x+3)}$$
$$= \frac{3\cancel{h}}{\cancel{h}(2x+3+2h)(2x+3)} = \boxed{\frac{3}{(2x+3+2h)(2x+3)}}$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then
$\frac{f(b)-f(a)}{b-a} =$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$. Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then
$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x}$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x+h$. Then
$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$

$=$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$=$$

The following examples use the identity $(A+B)(A-B)=A^2-B^2$ by substituting $A=\sqrt{x+h}$ and $B=\sqrt{x}$.
Then $(\sqrt{x+h}+\sqrt{x})(\sqrt{x+h}-\sqrt{x})=(\sqrt{x+h})^2-(\sqrt{x})^2=x+h-x=h$.

3.5 Let $f(x)=\sqrt{x}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$

$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$

$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}\cdot\frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x}) \cdot (\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h.$

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h.$ Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} =$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x}$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\not{h}}{\not{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\not{h}}{\not{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$

$$=$$

The following examples use the identity $(A+B)(A-B)=A^2-B^2$ by substituting $A=\sqrt{x+h}$ and $B=\sqrt{x}$. Then $(\sqrt{x+h}+\sqrt{x})(\sqrt{x+h}-\sqrt{x})=(\sqrt{x+h})^2-(\sqrt{x})^2=x+h-x=h$.

3.5 Let $f(x)=\sqrt{x}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$

$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$

$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}\cdot\frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$=\frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$=\frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$=\frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$=\frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})}=\boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x)=\frac{1}{\sqrt{x}}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$

$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$

$$=\frac{1}{h}\cdot\left(\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}\right)$$

$$=\frac{1}{h}\cdot\left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}}-\frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$

$$=\frac{1}{h}\cdot\left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$

$$=$$

The following examples use the identity $(A+B)(A-B)=A^2-B^2$ by substituting $A=\sqrt{x+h}$ and $B=\sqrt{x}$.
Then $(\sqrt{x+h}+\sqrt{x})(\sqrt{x+h}-\sqrt{x})=(\sqrt{x+h})^2-(\sqrt{x})^2=x+h-x=h$.

3.5 Let $f(x)=\sqrt{x}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$
$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$
$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}$$
$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}\cdot\frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$
$$=\frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$
$$=\frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$
$$=\frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$
$$=\frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})}=\boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x)=\frac{1}{\sqrt{x}}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$
$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$
$$=\frac{1}{h}\cdot\left(\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}\right)$$
$$=\frac{1}{h}\cdot\left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}}-\frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$
$$=\frac{1}{h}\cdot\left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$
$$=\frac{1}{h}\cdot\left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)\cdot\frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}$$
$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right) \cdot \frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}$$

$$= \frac{1}{h} \cdot \frac{(\sqrt{x}-\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}{(\sqrt{x}\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}$$

$$=$$

The following examples use the identity $(A+B)(A-B)=A^2-B^2$ by substituting $A=\sqrt{x+h}$ and $B=\sqrt{x}$.
Then $(\sqrt{x+h}+\sqrt{x})(\sqrt{x+h}-\sqrt{x})=(\sqrt{x+h})^2-(\sqrt{x})^2=x+h-x=h$.

3.5 Let $f(x)=\sqrt{x}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$
$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$
$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}$$
$$=\frac{\sqrt{x+h}-\sqrt{x}}{h}\cdot\frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$
$$=\frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$
$$=\frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$
$$=\frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$
$$=\frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})}=\boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x)=\frac{1}{\sqrt{x}}; a=x, b=x+h$. Then

$$\frac{f(b)-f(a)}{b-a}=\frac{f(x+h)-f(x)}{(x+h)-x}=\frac{f(x+h)-f(x)}{h}$$
$$=\frac{1}{h}\left(f(x+h)-f(x)\right)$$
$$=\frac{1}{h}\cdot\left(\frac{1}{\sqrt{x+h}}-\frac{1}{\sqrt{x}}\right)$$
$$=\frac{1}{h}\cdot\left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}}-\frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$
$$=\frac{1}{h}\cdot\left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$
$$=\frac{1}{h}\cdot\left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)\cdot\frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}$$
$$=\frac{1}{h}\cdot\frac{(\sqrt{x}-\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}{(\sqrt{x}\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}$$
$$=\frac{1}{h}\cdot\frac{(\sqrt{x})^2-(\sqrt{x+h})^2}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$
$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$

$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$

$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$

$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$

$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$

$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right) \cdot \frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}$$

$$= \frac{1}{h} \cdot \frac{(\sqrt{x}-\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}{(\sqrt{x}\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}$$

$$= \frac{1}{h} \cdot \frac{(\sqrt{x})^2-(\sqrt{x+h})^2}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$

$$= \frac{1}{h} \cdot \frac{x-(x+h)}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$

$$=$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$
$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$
$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$
$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$
$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$
$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x + h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$$
$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$
$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$
$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right) \cdot \frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}$$
$$= \frac{1}{h} \cdot \frac{(\sqrt{x}-\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}{(\sqrt{x}\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}$$
$$= \frac{1}{h} \cdot \frac{(\sqrt{x})^2-(\sqrt{x+h})^2}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$
$$= \frac{1}{h} \cdot \frac{x-(x+h)}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$
$$= \frac{1}{\cancel{h}} \cdot \frac{-\cancel{h}}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})} =$$

The following examples use the identity $(A+B)(A-B) = A^2 - B^2$ by substituting $A = \sqrt{x+h}$ and $B = \sqrt{x}$.
Then $(\sqrt{x+h} + \sqrt{x})(\sqrt{x+h} - \sqrt{x}) = (\sqrt{x+h})^2 - (\sqrt{x})^2 = x + h - x = h$.

3.5 Let $f(x) = \sqrt{x}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{\sqrt{x+h}-\sqrt{x}}{h}$$
$$= \frac{\sqrt{x+h}-\sqrt{x}}{h} \cdot \frac{\sqrt{x+h}+\sqrt{x}}{\sqrt{x+h}+\sqrt{x}}$$
$$= \frac{(\sqrt{x+h}-\sqrt{x})\cdot(\sqrt{x+h}+\sqrt{x})}{h(\sqrt{x+h}+\sqrt{x})}$$
$$= \frac{(\sqrt{x+h})^2-(\sqrt{x})^2}{h(\sqrt{x+h}+\sqrt{x})}$$
$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})}$$
$$= \frac{\cancel{h}}{\cancel{h}(\sqrt{x+h}+\sqrt{x})} = \boxed{\frac{1}{\sqrt{x+h}+\sqrt{x}}}$$

3.6 Let $f(x) = \frac{1}{\sqrt{x}}; a = x, b = x+h$. Then

$$\frac{f(b)-f(a)}{b-a} = \frac{f(x+h)-f(x)}{(x+h)-x} = \frac{f(x+h)-f(x)}{h}$$
$$= \frac{1}{h}\left(f(x+h) - f(x)\right)$$
$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}\right)$$
$$= \frac{1}{h} \cdot \left(\frac{1}{\sqrt{x+h}}\frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}}\frac{\sqrt{x+h}}{\sqrt{x+h}}\right)$$
$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right)$$
$$= \frac{1}{h} \cdot \left(\frac{\sqrt{x}-\sqrt{x+h}}{\sqrt{x}\sqrt{x+h}}\right) \cdot \frac{\sqrt{x}+\sqrt{x+h}}{\sqrt{x}+\sqrt{x+h}}$$
$$= \frac{1}{h} \cdot \frac{(\sqrt{x}-\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}{(\sqrt{x}\sqrt{x+h})\ (\sqrt{x}+\sqrt{x+h})}$$
$$= \frac{1}{h} \cdot \frac{(\sqrt{x})^2-(\sqrt{x+h})^2}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$
$$= \frac{1}{h} \cdot \frac{x-(x+h)}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}$$
$$= \frac{1}{\cancel{h}} \cdot \frac{-\cancel{h}}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})} = \boxed{\frac{-1}{\sqrt{x}\sqrt{x+h}(\sqrt{x}+\sqrt{x+h})}}$$