

Name: ANSWERS

Instructions: No calculators! Answer all problems in the space provided! Do your rough work on scrap paper.

1. If $f(x) = 2x^2 - x + 4$ and $g(x) = 3x - 1$, find:

(a) $f \circ g = \underline{18x^2 - 15x + 7}$ (b) $g \circ f = \underline{6x^2 - 3x + 11}$

2. Find the equation of the line that passes through the point $(3, -5)$ and (i) has slope -4 $y = -4x + 7$;

(ii) is perpendicular to $2x - 4y = 3$ $y = \frac{1}{2}x - \frac{13}{2}$

3. For $f(x) = \sqrt{x}$, find and simplify the difference quotient: $\frac{1}{\sqrt{x+h} + \sqrt{x}}$ OR $\frac{1}{\sqrt{b} + \sqrt{a}}$

4. The difference quotient also provides a way to find the average rate of change of a function. That is, $f_{avg} = \frac{f(b) - f(a)}{b - a}$ gives the average value of a function on the interval $[a, b]$. For $f(x) = \frac{1}{x}$, find the average rate of change between $x = 1$ and $x = 2$:

$f_{avg} = \underline{-\frac{1}{2}}$

5. Complete the following rules:

(a) $a^x \cdot a^y = \underline{a^{x+y}}$ (b) $a^{\frac{x}{y}} = \underline{\sqrt[y]{a^x} \text{ or } \sqrt[y]{a^x}}$ (c) $\log_a(x^n) = \underline{n \log_a x}$

(d) $\log_a\left(\frac{x}{y}\right) = \underline{\log_a x - \log_a y}$ (e) $\log_a 1 = \underline{0}$ (f) $\log_a 0 = \underline{\text{undefined}}$

(g) $(a^x)^y = \underline{a^{xy}}$ (h) $\log_a b = c$ means $a^c = b$

(i) $x^{-a} = \underline{\frac{1}{x^a}}$ (j) $\log_a a^x = \underline{x}$

6. True or false: $\log_a(x + y) = \log_a x + \log_a y$ FALSE!

7. Simplify: $\ln \sqrt{\frac{3x^2 e^x}{\sqrt{x}}} = \underline{\frac{\ln 3}{2} + \frac{3 \ln x}{4} + \frac{x}{2}}$

Bonus:

1. Solve the equation $e^{2x+7} = 10 \Rightarrow x = \underline{\frac{\ln 10 - 7}{2}}$

2. $\lim_{h \rightarrow 0} \frac{\left(\frac{1}{x+h} - \frac{1}{x}\right)}{h} = \underline{-\frac{1}{x^2}}$

3. Graph $y = \ln x$ below

