Math190 Final Exam Review Exercises

Please note that final exam questions could be drawn from ANY material from ANY part of the course, so you might see exam questions different from the ones below. However, ***if you can solve all these questions, you will probably do fine on the exam.***

1. Use the properties of real numbers to write the expression without parentheses.

$$-\frac{5}{3}(6x - 12y)$$

   A. $10y - 20x$
   B. $20y - 10x$
   C. $20x - 10y$
   D. $10x - 20y$
   E. $10x + 20y$

2. Simplify the expression below, eliminate any negative exponents.

$$\left(\frac{x^6y^{-2}}{3x^{-1}y}\right)^{-2}$$

   A. $\frac{x^{14}}{9y^6}$
   B. $\frac{9y^6}{x^{14}}$
   C. $\frac{y^6x^{14}}{9}$
   D. $\frac{9}{y^6x^{14}}$
   E. None of these

3. Simplify the expression $\sqrt[3]{a^2b}\sqrt[3]{a^7b}$.
   A. $a^3\sqrt[3]{b}$
   B. $a^3\sqrt[3]{b^2}$
   C. $a^3\sqrt{3b^2}$
   D. $a^3\sqrt{b^2}$
   E. $b^3\sqrt[3]{a^3}$

4. Perform the indicated operation and simplify: $(\sqrt{h^9+1}+1)(\sqrt{h^9+1}-1)$
   A. $h^9 + 1$
   B. $h^9 - 1$
   C. h^9
   D. $h^9 + 2\sqrt{h} - 1$
   E. None of these

5. Which of the following is *not* a correct **factorization** of the binomial $10x^2 + 40x$?

   A. $10x(x + 4)$

   B. $10(x^2 + 4x)$

   C. $5x(2x + 4)$

   D. $5x(2x + 8)$

   E. None of these

6. Simplify the rational expression: $\frac{x^2-25}{x^2-x-20}$

   A. $\frac{5}{4}$

   B. $\frac{x-5}{x-4}$

   C. $\frac{x+5}{x+4}$

   D. $\frac{25}{x+20}$

   E. None of the above

7. The equation of a circle is $x^2 + y^2 - 4x + 8y + 11 = 0$. What are the coordinates of the center and the length of the radius of the circle?

   A. center $(2, -4)$ and radius 3

   B. center $(-2, 4)$ and radius 3

   C. center $(2, -4)$ and radius 9

   D. center $(-2, 4)$ and radius 9

   E. none of the above

8. Which equation represents a line that is parallel to the line $2x + y = 3$?

   A. $4x + 2y = 5$

   B. $2x + 4y = 1$

   C. $y = 3 - 4x$

   D. $y = 4x - 2$

   E. none of the above

9. What is the value of x in the equation $\sqrt{x} + x = 20$?

   A. 14

   B. 25

   C. 16

   D. $16, 25$

   E. none of the above

9. _____

10. Find the midpoint of the line segment that joins $(-2, -4)$ and $(6, 2)$.

    A. $(2, 3)$

    B. $(2, -1)$

    C. $(4, -2)$

    D. $(4, 3)$

    E. none of the above

11. If $a + ar = b + r$, the value of a in terms of b and r can be expressed as

    A. $\frac{b}{r} + 1$

    B. $\frac{1+b}{r}$

    C. $\frac{1+b}{r+b}$

    D. none of the above

    E. $\frac{b-r}{1+r}$

12. How many real solutions does the quadratic equation $x^2 - 2x + 5 = 0$ have?

    A. no real solutions

    B. two real solutions

    C. four real solutions

    D. one real solution

    E. none of the above

13. Given $f(x) = -x^2 - x + 5$, find $f(-4)$.

    A. -15

    B. -7

    C. 17

    D. 25

    E. none of the above

14. Find the domain of the function $g(x) = \frac{2}{x-3}$.

    A. $(3, \infty)$

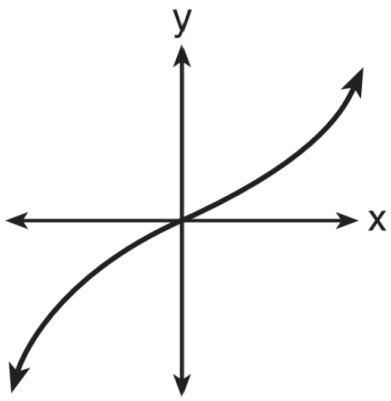
    B. $(-\infty, 3)$

    C. $(-\infty, 3) \cup (3, \infty)$

    D. $(-3, 3)$

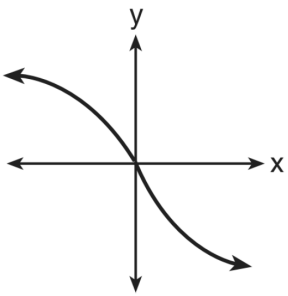
    E. none of the above

15. The graph below represents $f(x)$.



Which graph represents $-f(x)$?

Hint: This question is similar to question 7 from the study guide *but* it is not the same. So don't waste time trying to remember the answer to question 7. Instead think about what is the current question asking you for.

A.


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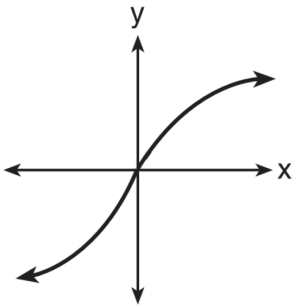

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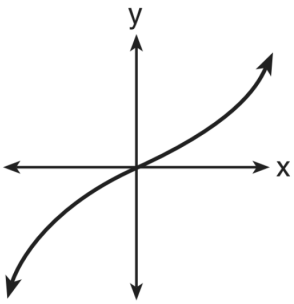

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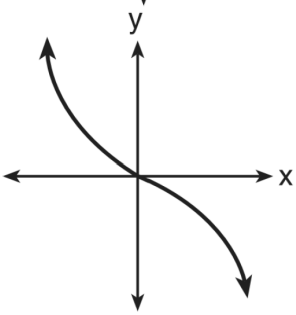


E. none of the above

16. If $f(x) = x^2$, which function formula is the result of **shifting** $f(x)$: 3 units left and 2 units down?

    A. $g(x) = (x+2)^2 - 3$

    B. $h(x) = (x-2)^2 + 3$

    C. $j(x) = (x+3)^2 - 2$

    D. $k(x) = (x-3)^2 + 2$

    E. none of the above

17. If the point $(4, 5)$ lies on the graph of $y = f(x)$, the graph of $y = f^{-1}(x)$ must contain the point

    A. $(5, 4)$

    B. $(4, 0)$

    C. $(0, 5)$

    D. none of the above

    E. $(-4, -5)$

18. If $g(x) = 3x - 5$ and $h(x) = 2x - 4$, find $g(h(x))$.

    A. $6x - 17$

    B. $6x - 14$

    C. $5x - 9$

    D. $x - 1$

    E. none of the above

19. Which is the equivalent exponential form of $\log_b N = x$?

    A. $b^N = X$

    B. $N^b = x$

    C. $x^b = N$

    D. $b^x = N$

    E. none of the above

20. Which of the following represents an exponential function?

A. $f(x) = 3x - 7$

B. $f(x) = 7x^3$

C. $f(x) = 3x^2 + 7$

D. $f(x) = 3(7)^x$

E. none of the above

21. If $f(x) = 6\left(\frac{1}{2}\right)^x$ then $f(3) =$

A. 5/8

B. 9/2

C. 9

D. 3/4

E. none of the above

22. A dog is attached to a 10 foot leash. He travels around an arc that has a length of 25 feet. Which of the following represents the radian angle θ he has rotated through?

A. 5

B. $\frac{5}{2}$

C. $\frac{15\pi}{2}$

D. $\frac{5\pi}{4}$

E. none of the above

23. In $\triangle MNP$, $\angle P$ is a right angle. If $MP = 24$, $NP = 10$, and $MN = 26$, then which of the following is the value of $\cos N$?

A. $\frac{12}{13}$

B. $\frac{5}{13}$

C. $\frac{13}{12}$

D. $\frac{12}{5}$

E. none of the above

24. Add: $\frac{7}{12} + \frac{5}{18}$

25. Simplify the expression $(-2x^2)^3(4x^6y)$ completely.

26. Rationalize the denominator: $\frac{12}{\sqrt{3}}$.

27. Perform the indicated operation and simplify: $(x+4)(2x^2-3x+5)$

28. Factor the expression $4x^2+4xy+y^2$ completely.

29. Perform the indicated operation and simplify: $\frac{2x}{x^2-7x+12} \cdot \frac{x^2-9}{6x^2}$

30. Solve the radical equation $3\sqrt{x-2}+5=17$ for x.

31. Find the equation of the line that passes through the point $(1,-6)$ and is perpendicular to the line $x+2y=6$. Write your answer in $y=mx+b$ form.

32. **Use the Quadratic Formula** to solve the quadratic equation $2x^2+5x-1=0$.

33. Find the distance between the points $(-2,5)$ and $(10,0)$).

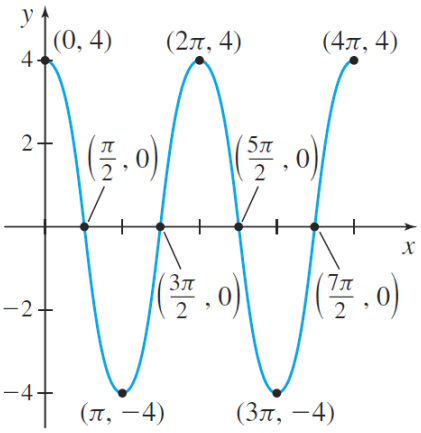
34. Find the y-intercepts of the graph of the equation $x^2-xy+y=1$. Write your answers in coordinate point form (x,y).

35. Solve the equation $x-\frac{1}{12}x-\frac{1}{2}x=\frac{20}{24}$ for x.

36. Find the Average Rate of Change of the function $f(x)=3x+4$ on the interval $[1,1+h]$

37. Let $f(x)=3x+5$.
    (a) Find the inverse function of f.
    (b) Find $f^{-1}(8)$.

38. The graph of $y=f(x)$ is given below. Use the graph to answer the following questions.



    (a) What is the domain of f? What is the range of f. Write your answer using interval notation.

(b) List the interval(s) on which f is increasing and decreasing.

(c) Find the local minimum and maximum values of f. Where do they occur?

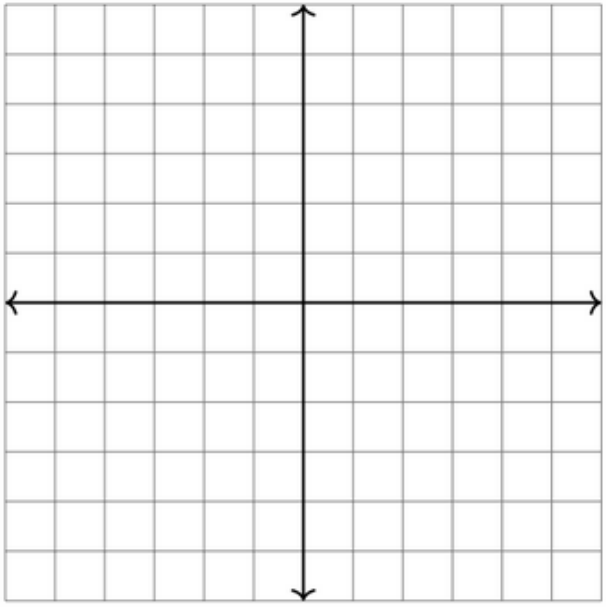
39. Let

$$h(x) = \begin{cases} 2x & \text{if } x < 1 \\ x - 2 & \text{if } x \geq 1 \end{cases}$$

(a) Complete the table below. ***Note that each box in the table is worth 0.5 points. A fully completed table is worth 8 points.***

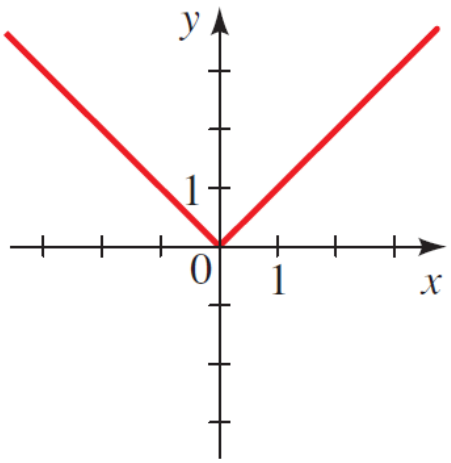
X	h(x)	(x, h(x))
-2		
-1		
0		
hole:		
1		
2		
3		
4		

Using the information from part (a), sketch the graph of $h(x)$.

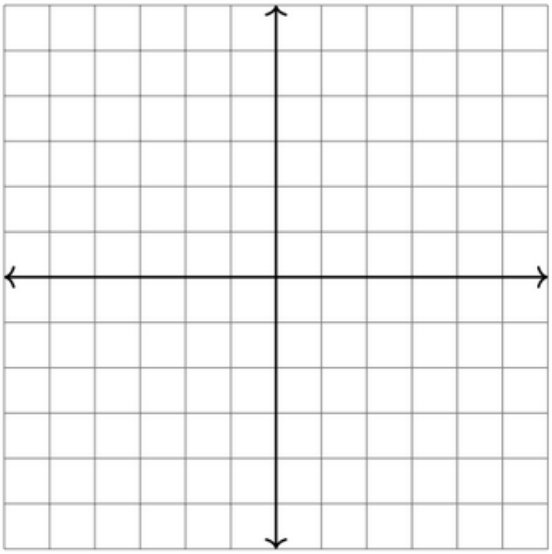


40. Use the graph of $y = |x|$ (see below) to graph $g(x) = |x + 2|$.

Graph of $y = |x|$:



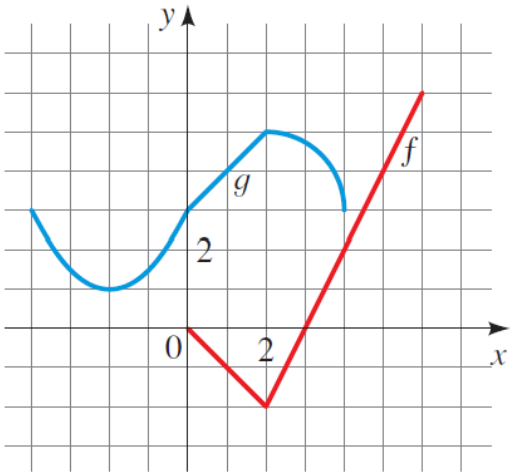
Sketch the graph of $g(x) = |x + 2|$ on the grid below.
Clearly label the x- and y-intercepts on your graph.



What is the range of $g(x)$? Write your answer using interval notation:

41. Answer the following questions below.

(a) Use the given graphs of f and g below, to find $(f \circ g)(0)$.



(b) Use the table below to find $f(f(3))$.

x	1	2	3	4	5	6
$f(x)$	2	3	5	1	6	3
$g(x)$	3	5	6	2	1	4

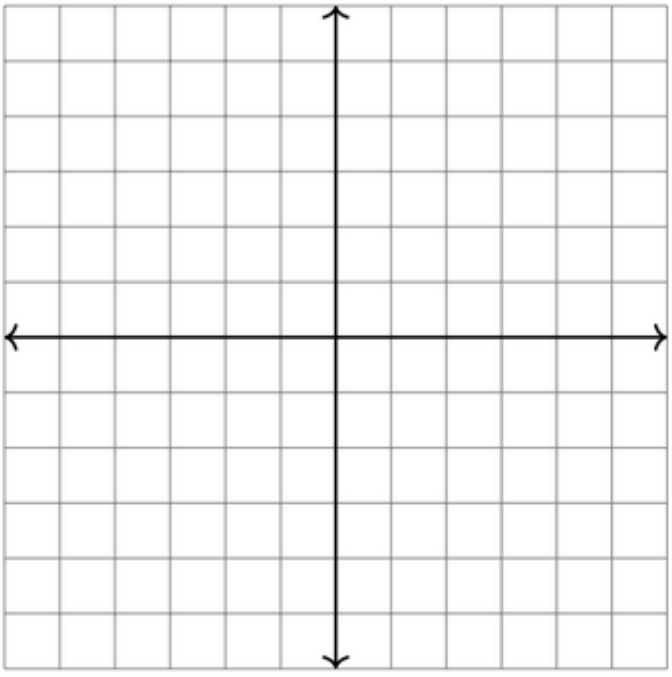
42. Let $f(x) = 3x^2 + 6x - 9$.

(a) Rewrite $f(x)$ in standard form by completing the square or you can use the formula $x = \frac{-b}{2a}$.

(b) Fill in the table below. Write "None" where appropriate. The entries "Increasing" and "Decreasing" should be followed by the intervals of increase or decrease in interval notation.

Vertex:		Increasing:	
Range:		Decreasing:	
Maximum:		Roots:	
Minimum:		y-intercept:	

(c) Use the set of axes provided to sketch the parabola.



43. Let $g(x) = \left(\frac{1}{4}\right)^x$. Find the following:

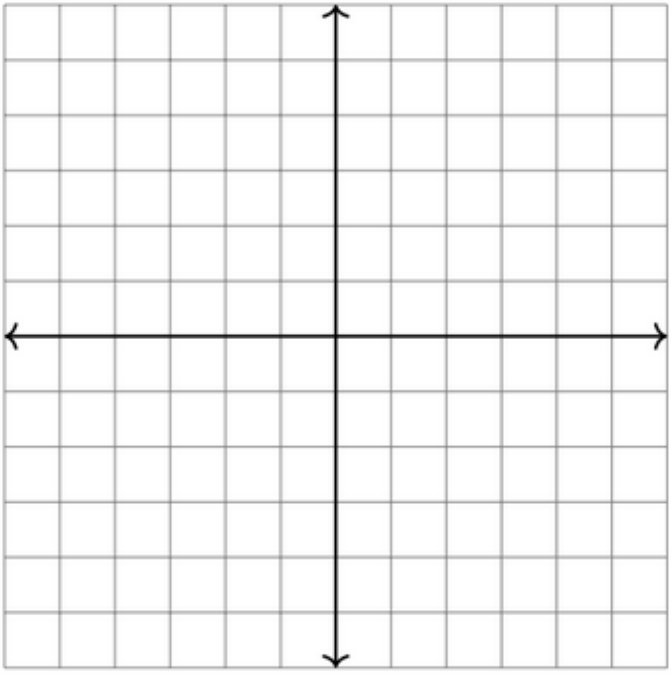
(a) $g(-2)$

(b) $g(-\frac{1}{2})$

(c) $g(0)$

(d) $g(\frac{3}{2})$

44. Graph the function $f(x) = -\left(\frac{1}{2}\right)^{-x} + 2$ using transformations of the graph of $g(x) = \left(\frac{1}{2}\right)^x$. Make sure to clearly show asymptotes, if any. Clearly list the transformations you are using. Algebraically, find the locations of the x and y intercepts for $f(x)$. State the domain and range of $f(x)$. Finally, state whether f is decreasing and increasing.



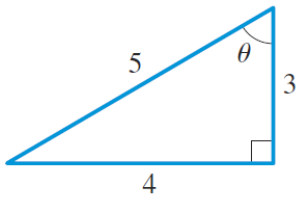
45. Evaluate the following logarithmic expressions.
    (a) $5^{\log_5(27)} =$
    (b) $\log_7(7^{10}) =$
    (c) $\log_3\left(\frac{1}{27}\right) =$
    (d) $\log_4\left(\frac{1}{2}\right) =$
    (e) $\log_4(8) =$

46. Convert the following angles to radians.
    (a) $15°$
    (b) $-45°$
    (c) $3600°$
    (d) $-150°$

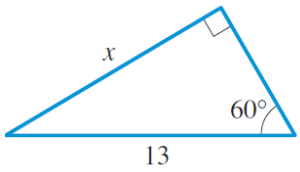
47. Convert the following angles to degrees.
    (a) $-\frac{3\pi}{2}$
    (b) $-\frac{13\pi}{12}$
    (c) $\frac{5\pi}{18}$
    (d) 3

48. Use the formula $s = r\theta$ to answer the questions below. Remember θ is in radians.
    (a) Find the length s of a circular arc when $r = 9$ and $\theta = \frac{5\pi}{6}$.
    (b) Find the length s of a circular arc when $r = 5$ and $\theta = 140°$.
    (c) Find the length s of a circular arc when $r = 5$ and $\theta = 3$ rad.
    (d) Find the length s of a circular arc when $r = 12$ and $\theta = 40°$.

49. Find the exact value of the six trigonometric ratios of the angle θ in the triangle.



50. Find the side labeled x.



51. Evaluate the trigonometric expressions.

(a) $\sin\frac{\pi}{6} + \cos\frac{\pi}{6}$

(b) $\sin 30^\circ \cos 60^\circ + \sin 60^\circ \cos 30^\circ$

(c) $\left(\sin\frac{\pi}{3}\cos\frac{\pi}{4} - \sin\frac{\pi}{4}\cos\frac{\pi}{3}\right)^2$

(d) $\sin 30^\circ \csc 30^\circ$