Math 2 Fall Final Review

Name: Key

1. Solve each of the following equations for the indicated variable:

a. $A = B - 5$, for B

$B = A + 5$

b. $y = 11x - 6$, for x

$x = \frac{y+6}{11}$

c. $P = nRT$, for R

$R = \frac{P}{nT}$

d. $K = \frac{LM}{N}$, for L

$L = \frac{KN}{M}$

2. *Function Notation:*

$j(x) = x^2 - 5$ $\quad k(x) = 6x + 1$ $\quad l(x) = \frac{x}{3}$

a. $k(-2)$

$K(-2) = -11$

b. $l(x) = 4$

$x = 12$

c. $l(18) + j(4)$

17

d. $j(5) - k(-3)$

37

***3.** Function Notation (with graphs):*

a. $f(1)$ -3

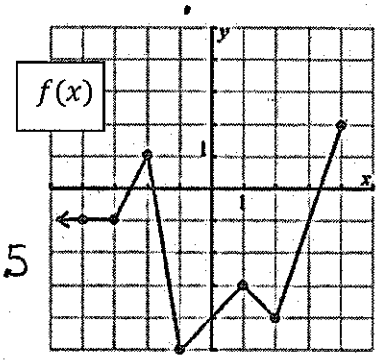
b. $g(1)$ -1

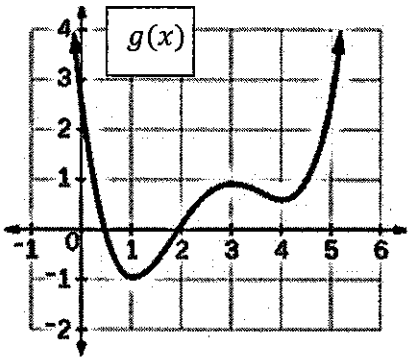
c. $f(x) = 2$ $x = 2$

d. $g(x) = 1$ $x = 3$ and $x = 0.3$ and $x = 4.5$

e. $f(-2) + g(3)$ $\quad 1 + 1 = 2$

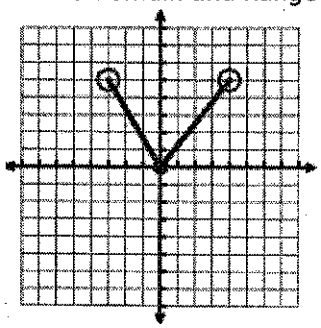
f. $g(1) - f(-4)$ $\quad -1 - (-1) = 0$





***4.** Find the Domain and Range for each of the following graphs. Then, determine if the graph represents a function.*

a.

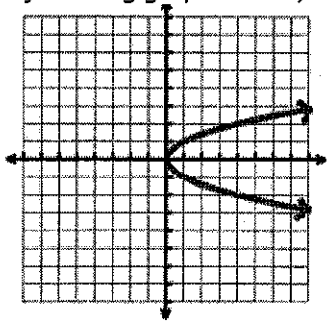


Domain: $(-3, 4)$

Range: $[0, 5)$

Function?: yes

b.

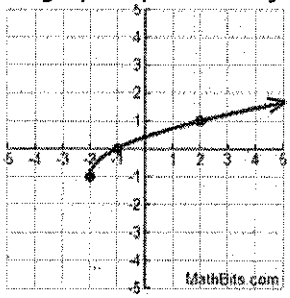


Domain: $[0, \infty)$

Range: $(-\infty, \infty)$

Function?: no

c.



Domain: $[-2, \infty)$

Range: $[-1, \infty)$

Function?: yes

5. *Given the parent function and the transformation for each, write the new equation.*

a. Parent Function: $f(x) = x^2$

Up 3 units and right 1 unit

$f(x) = (x-1)^2 + 3$

b. Parent Function: $f(x) = \sqrt{x}$

Reflect over the x-axis

$f(x) = -\sqrt{x}$

c. Parent Function: $f(x) = x^3$

Dilate by a magnitude of -3

$f(x) = -3x^3$

6. *For each of the following functions,* ***describe the transformation*** *from the parent function. Then,* ***graph the function****. Finally, write the* ***domain and range*** *of the function.*

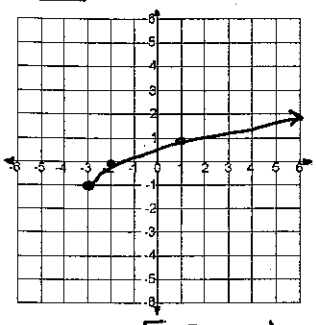
a. $f(x) = \sqrt{x+3} - 1$

Describe:

Left 3

Down 1

Graph:



Domain: $[-3, \infty)$

Range: $[-1, \infty)$

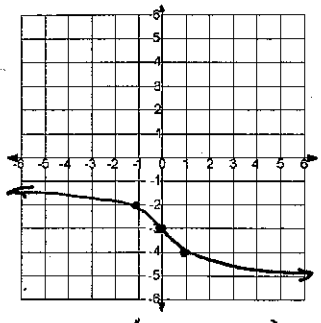
b. $f(x) = -\sqrt[3]{x} - 3$

Describe:

Reflect over x-axis

Down 3

Graph:



Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

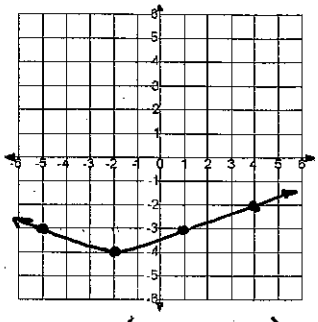
c. $f(x) = \frac{1}{3}|x+2| - 4$

Describe:

Dilate by factor 1/3

Left 2, down 4

Graph:

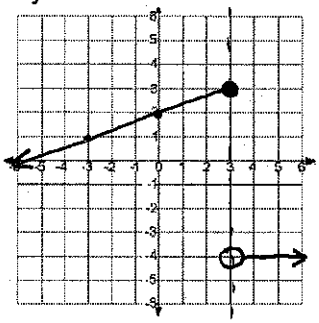


Domain: $(-\infty, \infty)$

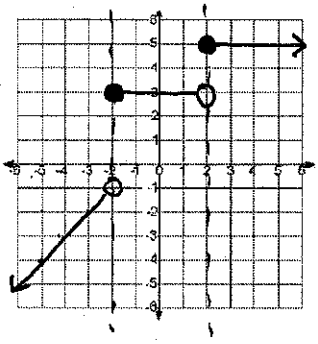
Range: $[-4, \infty)$

7. *Graph the following piecewise functions.*

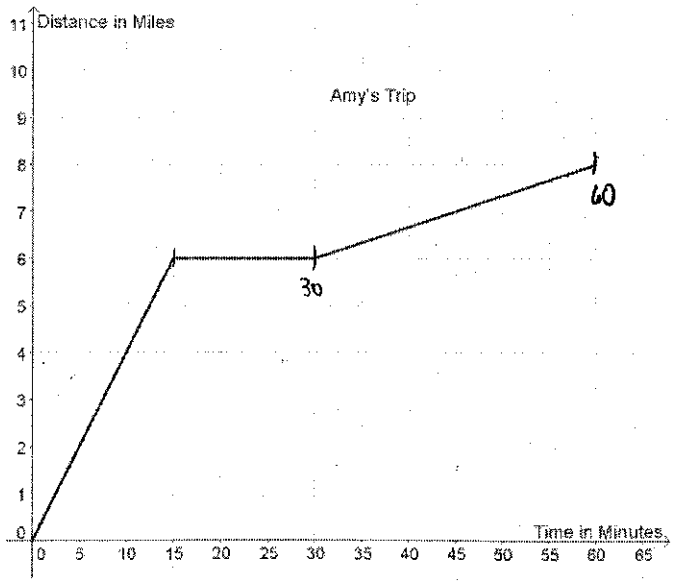
a. $f(x) = \begin{cases} \frac{1}{3}x + 2, & if\ x \le 3 \\ -4, & if\ x > 3 \end{cases}$



b. $f(x) = \begin{cases} x + 1, & if\ x < -2 \\ 3, & if\ -2 \le x < 2 \\ 5, & if\ x \ge 2 \end{cases}$



8. *Amy is taking a trip on a bicycle. The graph shows her distance traveled over time.*



a. For this situation, Distance (y) is a function of Time (x).

b. The graph has three pieces. Write an equation for each part.

$$d(t) = \begin{cases} \frac{2}{5}t & for\ 0 < t < 15 \\ 6 & for\ 15 \le t < 30 \\ \frac{1}{15}t + 4 & for\ 30 \le t \le 60 \end{cases}$$

9. *For each of the following, convert the expression from* ***radical form*** *to* ***exponential form****:*

a. $\sqrt[6]{y^7}$ $y^{7/6}$ **b.** $\sqrt{d^3}$ $d^{3/2}$

10. *For each of the following, convert the expression from* ***exponential form*** *to* ***radical form****.*

a. $k^{\frac{5}{2}}$ $\sqrt{k^5}$ **b.** $a^{\frac{1}{4}}$ $\sqrt[4]{a}$

11. ***Simplify*** *each of the following expressions completely.*

a. $\sqrt{150x^8y^5}$ $5x^4y^2\sqrt{6y}$

b. $\sqrt[3]{600m^7n^{12}}$ $2m^2n^4\sqrt[3]{75m}$

c. $(192r^3t^4)^{\frac{1}{2}}$ $\sqrt{192r^3t^4}$ $8rt^2\sqrt{3r}$

d. $(192r^3t^4)^{\frac{1}{3}}$ $\sqrt[3]{192r^3t^4}$ $4rt\sqrt[3]{3t}$

12. *Solve each of the following equations for the indicated variable.*

a. $\sqrt{x-5}=8$ $x=69$

b. $3\sqrt[3]{x}-2=13$ $x=125$

c. $|x+3|=4$ $x=1$ $x=-7$

d. $|2x-3|=7$ $x=5$ $x=-2$

13. *Write the rules for the following transformations:*

a. Reflection over the line y = x $(x,y)\rightarrow(y,x)$

b. Translation 3 left and 7 up. $(x,y)\rightarrow(x-3,y+7)$

c. Rotation 90° clockwise $(x,y)\rightarrow(y,-x)$

d. Dilation with a factor of 1/3. $(x,y)\rightarrow(\frac{1}{3}x,\frac{1}{3}y)$

e. Reflection over the x-axis $(x,y)\rightarrow(x,-y)$

f. Rotation 270° counterclockwise $(x,y)\rightarrow(y,-x)$

14. *Write describe each of the transformations in words.*

a. $(x,y)\rightarrow(x+3,y-2)$ Translation right 3 down 2

b. $(x,y)\rightarrow(-x,-y)$ Rotation 180°

c. $(x,y)\rightarrow(2x,2y)$ Dilation by scale factor 2

d. $(x,y)\rightarrow(-y,-x)$ Reflection over $y=-x$

e. $(x,y)\rightarrow(-x-2,y+6)$ Reflection over y-axis Translation left 2, up 6

f. $(x,y)\rightarrow(y+2,x-5)$ Reflection over $y=x$ Translation right 2, down 5

15. *Use the matrix* $DOG=\begin{bmatrix}0 & -2 & 4\\ 5 & 1 & -1\end{bmatrix}$ *for each of the following transformations.*

a. Translate 4 left and 3 down $(x,y)\rightarrow(x-4,y-3)$ $D'O'G'=\begin{bmatrix}-4 & -6 & 0\\ 2 & -2 & -4\end{bmatrix}$

b. Dilate with scale factor 2 $(x,y)\rightarrow(2x,2y)$ $D'O'G'=\begin{bmatrix}0 & -4 & 8\\ 10 & 2 & -2\end{bmatrix}$

c. Rotate 90° counterclockwise $(x,y)\rightarrow(-y,x)$ $D'O'G'=\begin{bmatrix}-5 & -1 & 1\\ 0 & -2 & 4\end{bmatrix}$

16. *For each of the following, find the* ***slope*** *and the* ***distance*** *between the points* $A(2,-5)$ *and* $B(5,-9)$

Slope: $-4/3$

Distance: 5

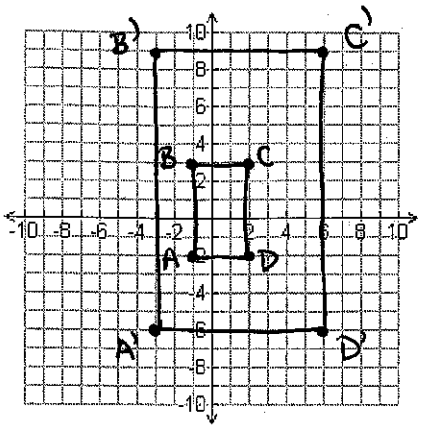
17. *The rectangle ABCD* $= \begin{bmatrix} -1 & -1 & 2 & 2 \\ -2 & 3 & 3 & -2 \end{bmatrix}$ *is enlarged using a dilation with scale factor 3.*

a. Write the coordinate rule.

$(x,y) \rightarrow (3x,3y)$

b. Write the matrix for A'B'C'D'.

$\begin{bmatrix} -3 & -3 & 6 & 6 \\ -6 & 9 & 9 & -6 \end{bmatrix}$

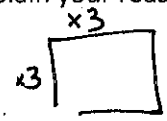


c. Graph ABCD and A'B'C'D'.

d. If the length of AB is 5 units, what is the length of A'B'? 15 Explain your reasoning. It's 5·3

e. If the area of quadrilateral ABCD is 15 square units, what is the area of quadrilateral A'B'C'D'? 135 Explain your reasoning.

You have to do ×3 for length + width, so it ends up being ×9



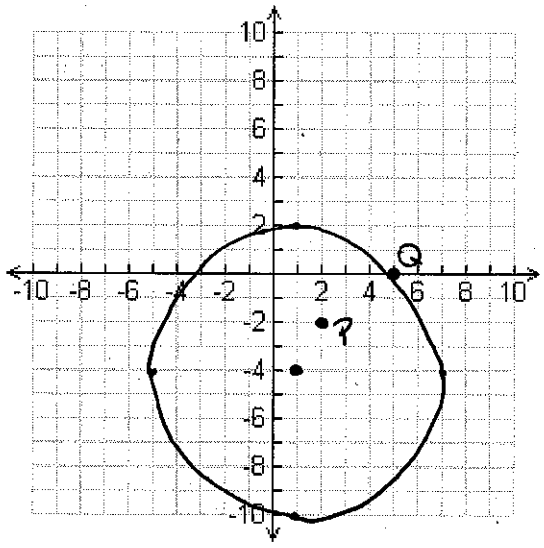
18. *Are the following pairs of points* ***parallel***, ***perpendicular***, *or* ***neither****? Show your work and explain your answer.*

$B(-6,7)\ C(-5,9)$ and $J(3,10)\ K(7,8)$

$BC = \frac{2}{1}$ $JK = \frac{-2}{4} = \frac{-1}{2}$ Perpendicular because the slopes are opposite reciprocal

19. A particular cell phone tower is designed to service a 6-mile radius. The tower is located at $(1,-4)$ on a coordinate plane whose units represent miles.

a. Draw a circle representing the service range on the graph below.



b. What is the standard equation of the outer boundary of the region serviced by the tower?

$(x-1)^2 + (y+4)^2 = 36$

c. Cell phone user Q is located at $(5,0)$. Are they within the service range? Explain your answer.

$(5-1)^2 + (0+4)^2 = 36$

$4^2 + 16 + 16 \quad 36$

32 is less than 36, so yes, they are within service range.

d. Cell phone user P is located at $(2,-2)$. Are they within the service range? Explain your answer.

yes, the point is obviously within the circle, so they are within the service range.

20. **Factor** completely each of these quadratic expressions.

a. $x^2 + x - 42$

$(x+7)(x-6)$

b. $x^2 - 81$

$(x+9)(x-9)$

c. $x^2 - 17x + 60$

$(x-12)(x-5)$

d. $2x^2 - 6x - 56$

$2(x-7)(x+4)$

e. $5x^2 - 15x$

$5x(x-3)$

f. $-3x + 27$

$-3(x-9)$

21. Rewrite each of these quadratic expression in equivalent **standard form**.

a. $(x-7)(x+1)$ x^2-6x-7

b. $(3x+5)(x-2)$ $3x^2-x-10$

c. $(x-4)(x+4)$ x^2-16

d. $(x-6)^2$ $x^2-12x+36$

22. Solve using the **quadratic formula**.

a. $2x^2+x-15=0$

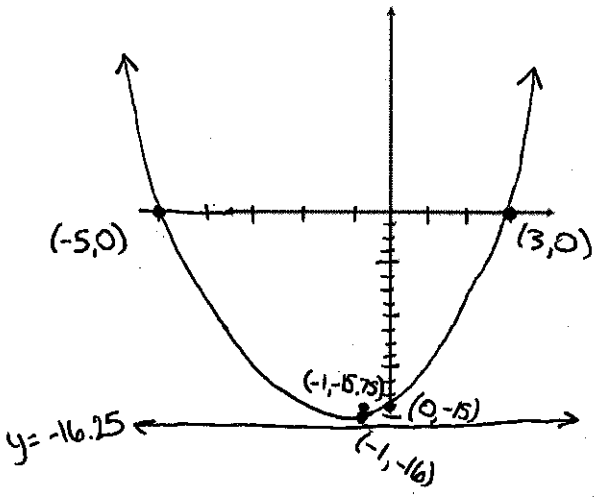
$x=\frac{5}{2}$ $x=-3$

b. $x^2+5x=1$

$x^2+5x-1=0$

$x=\frac{-5\pm\sqrt{29}}{2}$

23. Graph the following quadratic equation without a calculator. Your graph much include the following critical components: x-intercepts, y-intercept, vertex, directrix, and focus. To receive full credit you must show all of your work for each component: $y = x^2 + 2x - 15$



x-intercepts: (-5,0) & (3,0) y-intercept: (0,-15) max/min: vertex: (-1,-16) focus: (-1,-15.75) directrix: y=-16.25

24. Kevin decides to throw a basketball from the top of the bleachers. The basketball's height (in feet above ground), x seconds after Kevin threw it, is modeled by: $h(x) = -4x^2 + 8x + 12$

a. At what time does the basketball hit the ground?

3 seconds

b. Sketch a graph of the situation using the vertex, y-intercept, and x-intercept.

vertex (1, 16)
y-int (0,12)
x-int: (-1,0)
(3,0)