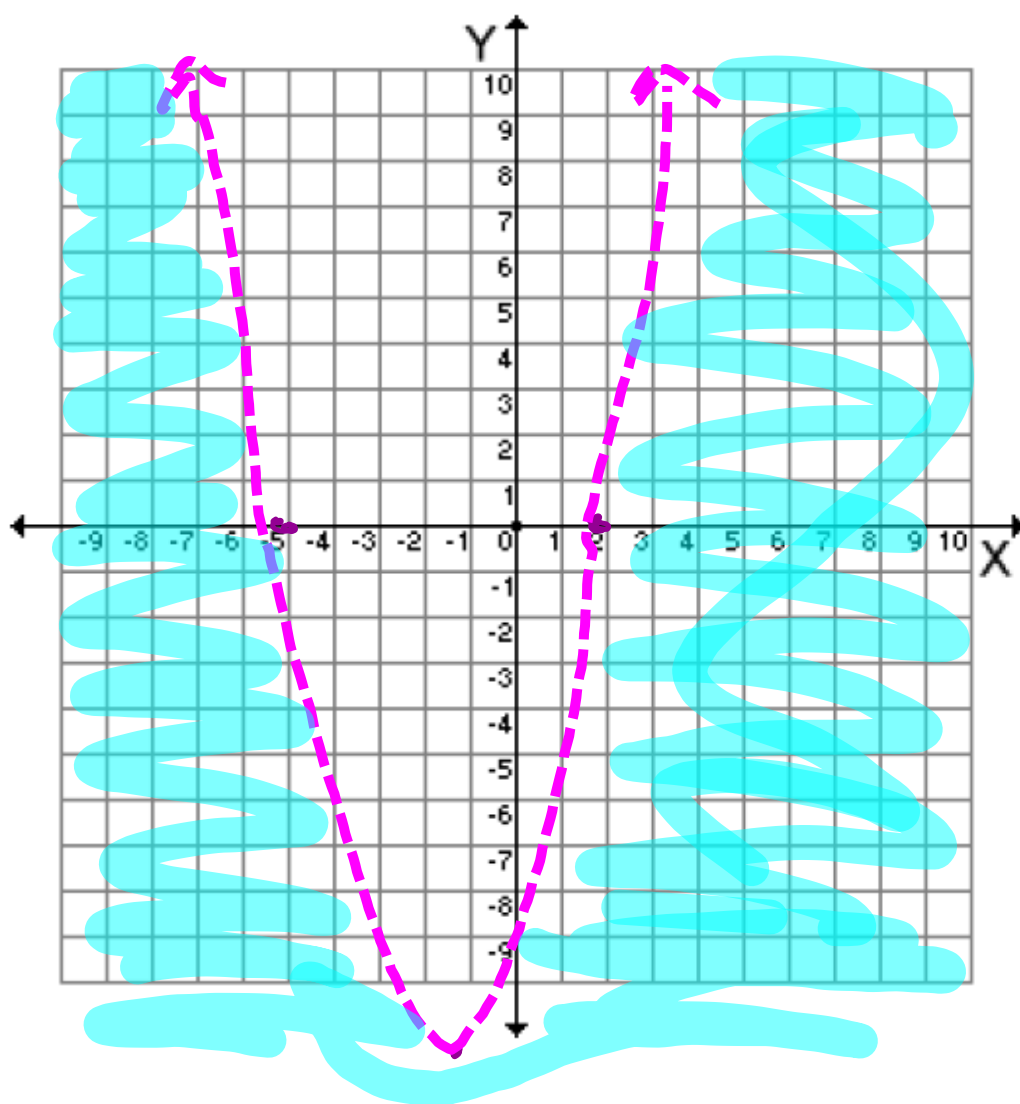


Day 13 Quadratic Inequalities

1. $x^2 + 3x - 10 > 0$



$$\frac{5}{3}x^2 - 10x + 2 \quad (x+5)(x-2)$$

$$(0,0) \quad -10 > 0 \text{ false}$$

Points Up or Down, Why? ^{UP}

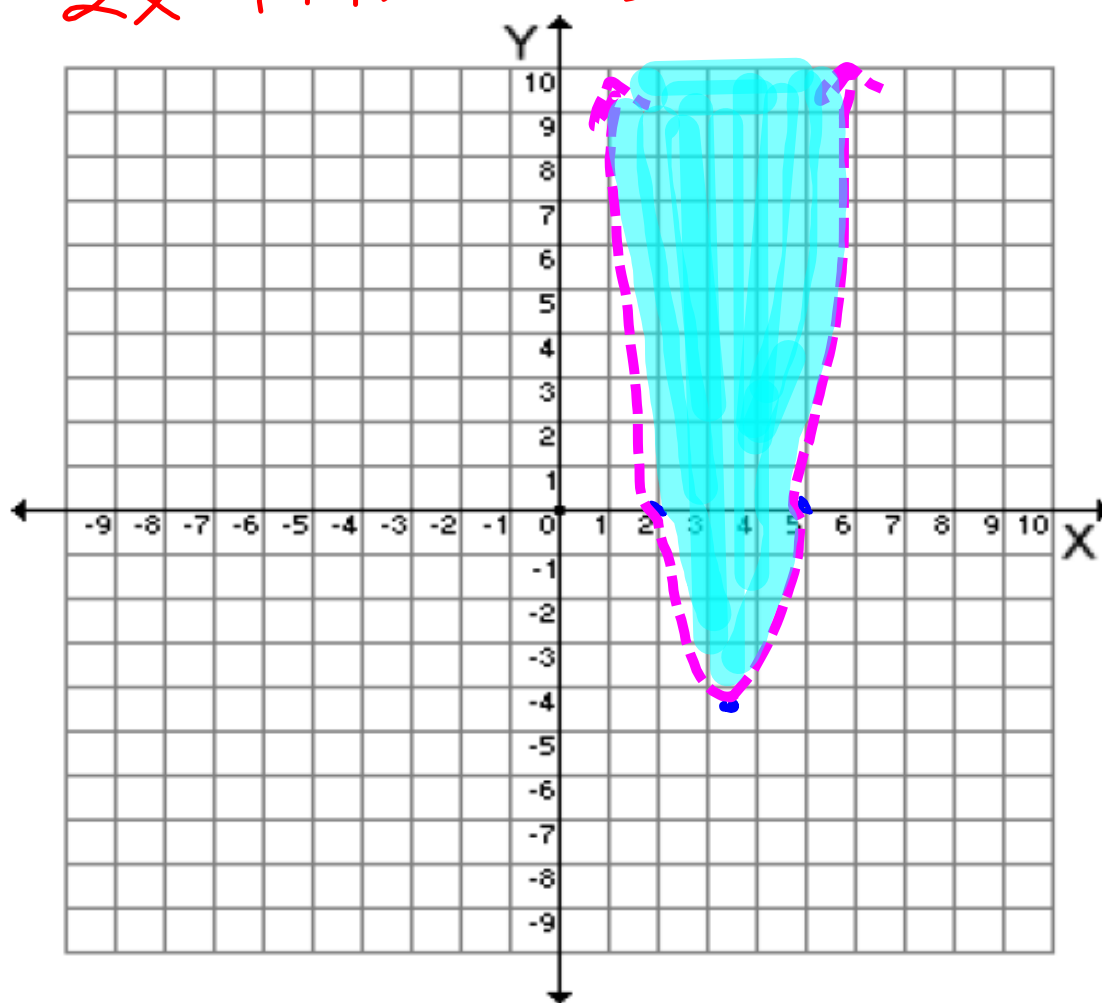
Vertex: $(-1.5, -12.25)$

Roots: $x = -5, 2$

Solutions: $(6, 1)$

4. $-2x^2 + 14x > 20$

$$-2x^2 + 14x - 20 > 0$$



$$-2(x^2 - 7x + 10) > 0$$

$$\begin{array}{c} \cancel{10} \\ \cancel{-5} \quad \cancel{-2} \\ \cancel{-7} \end{array} (x-5)(x-2)$$

$$x = \frac{5+2}{2} = \frac{7}{2} = 3.5$$

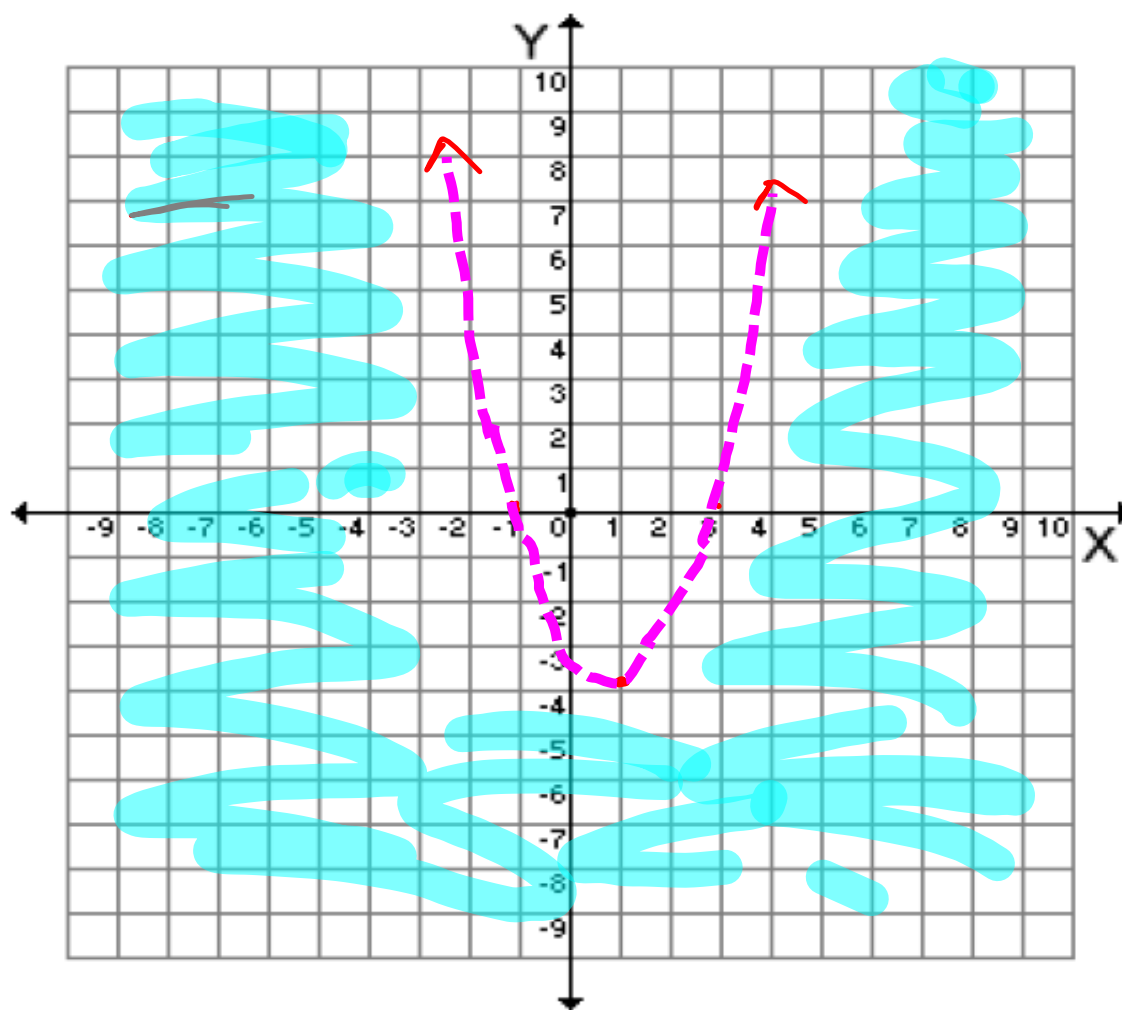
Points Up or Down, Why? down

Vertex: (3.5, 4.5)

Roots: x = 5, 2

Solutions: (3, 3)

5. $y > x^2 - 2x - 3$



$$(0)^2 - 2(0) - 3$$

$$0 < -3$$

False

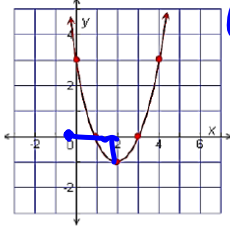
Points Up or Down, Why? Up

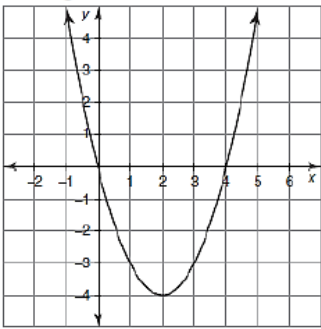
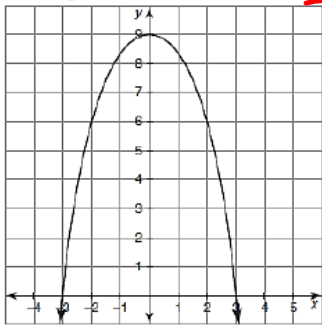
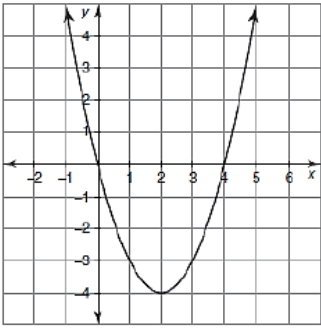
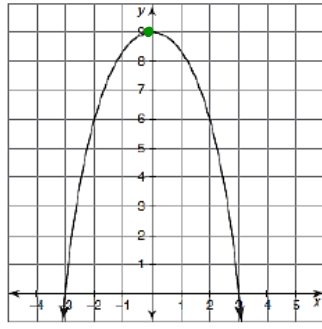
Vertex: 1, -4

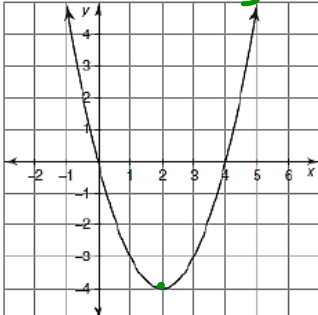
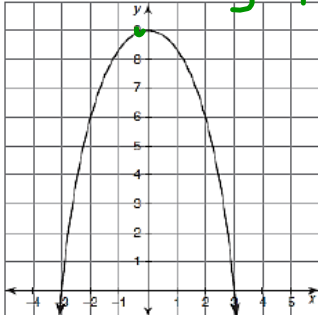
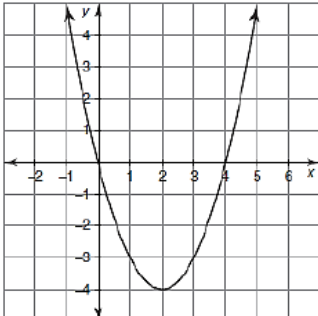
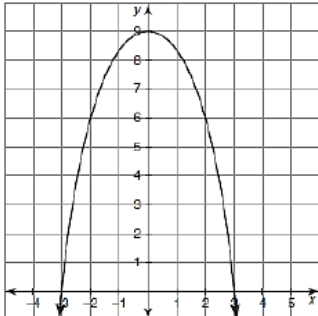
Roots: x = 3, -1

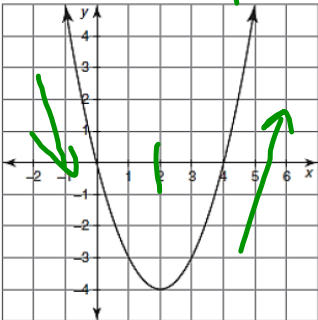

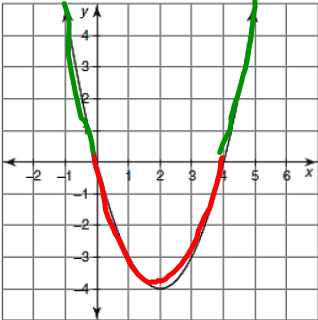
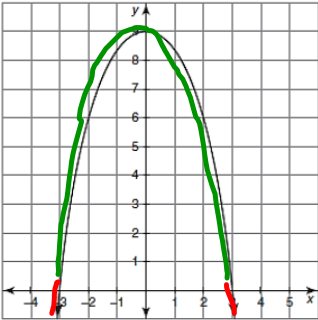
Solutions: (4, 1)

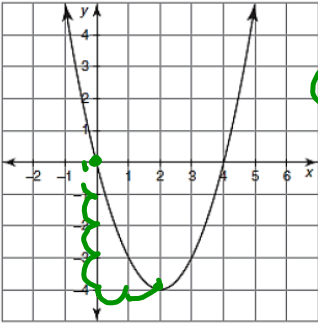
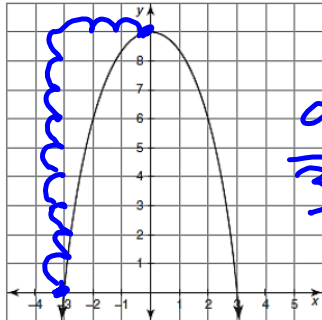
Unit 3B Study Guide 3/14/18

What you need to know & be able to do	Things to remember	Examples	
1. Describe transformations from an equation or graph	$y = a(x - h)^2 + k$ a: stretches/shrinks & reflects h: shifts left & right k: shifts up & down vertex: (h, k)	a. Describe the transformations and name the vertex: $y = -2(x + 3)^2 - 9$ Vertex: $(-3, -9)$	a. Describe the transformations and name the vertex: $(2, -1)$  h $-$
2. Create a function using transformations	Determine your, a, h, and k values	a. Opens down, shifts up 3 units and shrinks by $\frac{1}{4}$ $y = -\frac{1}{4}x^2 + 3$	b. Shifts left 5 and reflects across the x-axis $y = -(x + 5)^2$

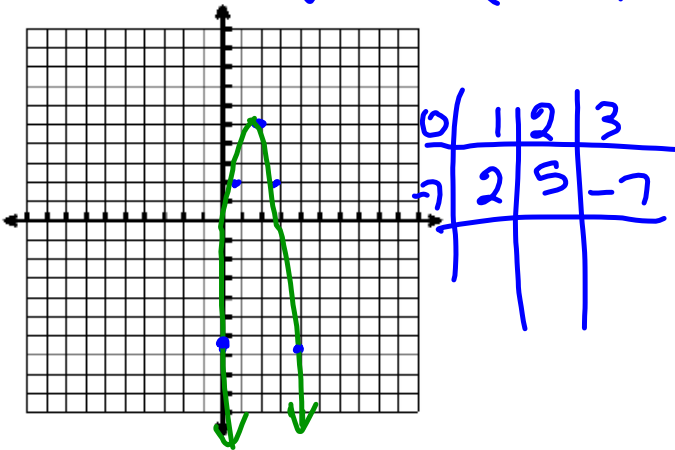
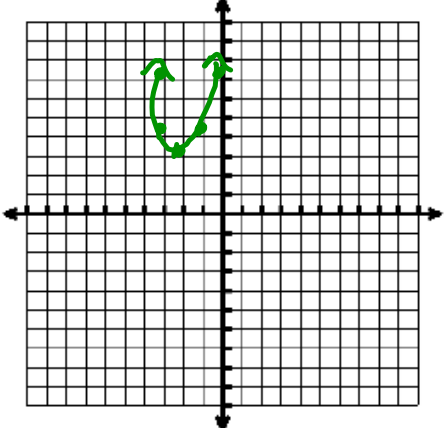
<p>3. Describe the domain and range.</p>	<p>-Domain: all possible values for x</p> <p>-Range: all possible values for y</p> <p>-“How far up or down does your graph go?”</p> <p>-written as an inequality</p>	<p>a. Domain: $\mathbb{R} \text{ } (-\infty, \infty)$</p> <p>Range: $[-4, \infty)$</p> 	<p>b. Domain: $\mathbb{R} \text{ } (-\infty, 9]$</p> <p>Range: $[-\infty, 9]$</p> 
<p>4. Describe the intercepts and zeros.</p>	<p>Zeros and x-intercepts are the same thing.</p> <p>Zeros: $x = \underline{\hspace{2cm}}$</p> <p>X-int: $(p, 0) \text{ } (q, 0)$</p> <p>Y-int: $(0, c)$</p>	<p>a. x-intercepts: $(0, 0) \text{ } (4, 0)$ zeros: $0, 4$</p> <p>y-intercept: $(0, 0)$</p> 	<p>b. x-intercept: $(-3, 0) \text{ } (3, 0)$ zeros: $x = -3 \text{ } 3$</p> <p>y-intercept: $(0, 9)$</p> 

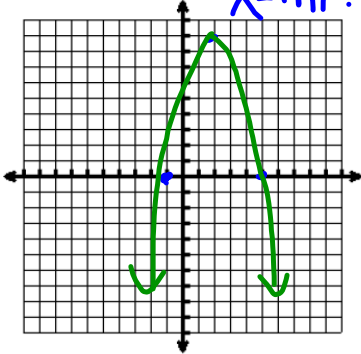
<p>5. Describe the vertex, axis of symmetry, extrema, and min/max values.</p>	<p>Vertex: highest or lowest point</p> <p>Axis of Symmetry: x value of the vertex; written as x =</p> <p>Extrema: Max or Min?</p> <p>Max/Min Value: What's the lowest or highest your graph goes; written as y =</p>	<p>a. Vertex: $(2, -4)$ Axis of Sym: $x=2$</p> <p>Extrema: Min Max/Min Value: $y=-4$</p> 	<p>b. Vertex: $(0, 9)$ Axis of Sym: $x=0$</p> <p>Extrema: Max Max/Min Value: $y=9$</p> 
<p>6. Describe the end behavior.</p>	<p>Which direction are the ends of the graph headed? To positive or negative infinity?</p>	<p>a. As $x \rightarrow -\infty, f(x) \rightarrow \infty$</p> <p>As $x \rightarrow \infty, f(x) \rightarrow \infty$</p> 	<p>b. As $x \rightarrow -\infty, f(x) \rightarrow -\infty$</p> <p>As $x \rightarrow \infty, f(x) \rightarrow -\infty$</p> 

<p>7. Describe the intervals of increase or decrease.</p>	<p>Draw your axis of symmetry and create an inequality to represent to the left and right of the axis of symmetry.</p> <p>Then determine which direction the graph is going on the left and then on the right using your inequalities.</p>	<p>a. Interval of Increase: $(2, \infty)$ Interval of Decrease: $(-\infty, 2)$</p> 	<p>b. Interval of Increase: $(-\infty, 0)$ Interval of Decrease: $(0, \infty)$</p> 
<p>8. Describe the positive and negative parts of the graph</p>	<p>Determine which parts of the graph are above or below the x-axis.</p> <p>Use inequalities to describe the different regions using the x-intercepts.</p>	<p>a. Positive: $x < 0, x > 4$ Negative: $0 < x < 4$</p> 	<p>b. Positive: $-3 < x < 3$ Negative: $x < -3, x > 3$</p> 

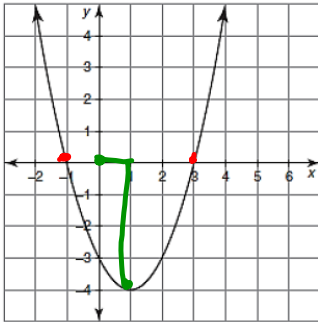
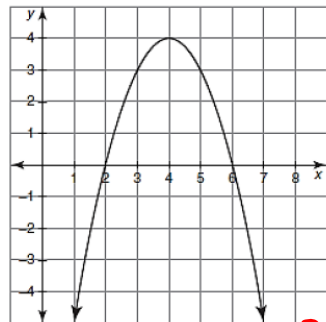
<p>9. Find the average rate of change given a graph</p>	<p>-Determine your two x-values and find their corresponding y-values on the parabola.</p> <p>-Calculate the rate of change (rise over run)</p>	<p>a. On interval from $0 \leq x \leq 2$:</p> 	<p>b. On interval from $-3 \leq x \leq 0$:</p> 
<p>10. Find the average rate of change given an equation</p>	<p>Find two points (by substituting x-values into the equation to get your y-values.</p> <p>Then use slope formula</p>	<p>a. Calculate the average rate of change for $y = x^2 + 1$ on the interval $0 \leq x \leq 2$.</p> <p>$f(0) = 1$ $(0, 1)$ x_1, y_1</p> <p>$f(2) = 5$ $(2, 5)$ x_2, y_2</p>	

$$AROC = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 1}{2 - 0} = \frac{4}{2}$$

<p>11. Graph in vertex form</p>	<p>1. Determine your vertex.</p> <p>2. Create a table with 2 values to the left and right of the vertex.</p> <p>3. Graph.</p> <p>$1^2 = 1 \cdot 3 = 3$ $2^2 = 4 \cdot 3 = 12$</p>	<p>a. Graph the following equation: $y = -3(x - 2)^2 + 5$</p> <p>Vertex: $(2, 5)$</p>  <table border="1"> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>-7</td> <td>3</td> <td>5</td> <td>-7</td> </tr> </table>	0	1	2	3	-7	3	5	-7
0	1	2	3							
-7	3	5	-7							
<p>12. Graph in standard form</p> <p>$-\frac{(4)}{2(1)} = 2$ $(-2)^2 + 4(-2) + 7$ $= 3$ $(-2, 3)$</p>	<p>1. Determine your vertex $\left(x = \frac{-b}{2a}\right)$.</p> <p>2. Create a table with 2 values to the left and right of the vertex.</p> <p>3. Graph.</p>	<p>a. Graph the following equation: $y = x^2 + 4x + 7$</p> 								

<p>13. Graph in factored form</p>	<p>1. Determine your x-intercepts and plot them.</p> <p>2. Determine you vertex (find the middle of the two x-intercepts or use $x = \frac{p+q}{2}$).</p> <p>3. Plot vertex and graph.</p>	<p>a. Graph the following equation: $y = -(x+1)(x-5)$</p> <p>X-int: $(-1, 0), (5, 0)$</p> <p>$x = \frac{-1+5}{2} = 2$</p> <p>$-(2+1)(2-5)$ $(-3)(-3) = 9$</p> <p>$V = (2, 9)$</p> 	
<p>14. Different Forms of Quadratics</p>	<p>Vertex Form: $y = a(x-h)^2 + k$ (h, k) is vertex</p> <p>Standard Form: $y = ax^2 + bx + c$ $(0, c)$ is y-intercept</p> <p>Factored Form: $y = a(x-p)(x-q)$ $(p, 0)$ & $(q, 0)$ are x-intercepts</p> <p>A determines if graph opens up or down</p>	<p>a. Determine the form and associated characteristics: $y = 2(x+4)(x-3)$</p> <p>$(-4, 3)$</p> <p>x-int intercept form</p>	<p>b. Determine the form and associated characteristics: $y = (x-5)^2 + 9$</p> <p>Vertex $(5, 9)$</p>
		<p>c. Determine the form and associated characteristics: $y = -x^2 + 6x - 1$</p> <p>y-int = $(0, -1)$</p> <p>Standard</p>	<p>d. Determine the form and associated characteristics: $y = -(x+2)^2$</p> <p>Vertex $(-2, 0)$</p>

<p>15. Converting between forms</p>	<p>Use your Converting Between Forms graphic organizer.</p>	<p>a. What characteristics can you describe in $y = (x + 4)(x - 7)$?</p> <p>$x = -4, 7$ intercept form</p> <p>Convert to standard form. What new characteristic can you give?</p> <p>$x \begin{array}{ c c } \hline & x+4 \\ \hline x & x^2 & 4x \\ \hline \end{array}$</p> <p>$-7 \begin{array}{ c c } \hline & -7x \\ \hline & -28 \\ \hline \end{array}$</p> <p>$x^2 - 3x - 28$</p>	<p>b. What characteristics can you describe in $y = (x + 3)^2 - 5$?</p> <p>$(-3, -5)$ Vertex form</p> <p>Convert to standard form. What new characteristic can you give?</p> <p>$x \begin{array}{ c c } \hline & x+3 \\ \hline x & x^2 & 3x \\ \hline \end{array}$</p> <p>$+3 \begin{array}{ c c } \hline & 3x \\ \hline & 9 \\ \hline \end{array}$</p> <p>$x^2 + 6x + 9 - 5$</p> <p>$x^2 + 6x + 4$</p> <p>$y\text{-int: } (0, 4)$</p>
<p>$a=1, b=6$</p> <p>$x = -3$</p> <p>$f(-3)$</p> <p>$= (-3)^2 + 6(-3) + 4$</p> <p>$= -5$</p> <p>$V = (-3, -5)$</p>	<p>c. What characteristics can you describe in $y = x^2 + 6x + 4$?</p> <p>$V\text{inter: } (0, 4)$ Standard</p> <p>Convert to vertex form. What new characteristic can you give?</p> <p>$y = (x + 3)^2 - 5$</p>	<p>d. What characteristics can you describe in $y = x^2 - 5x - 24$?</p> <p>Standard $y\text{int: } (0, -24)$</p> <p>Convert to factored form. What new characteristic can you give?</p> <p>$-8 \begin{array}{ c } \hline -24 \\ \hline \end{array} \begin{array}{ c } \hline 3 \\ \hline \end{array}$</p> <p>$-5$</p> <p>$y = (x - 8)(x + 3)$</p>	

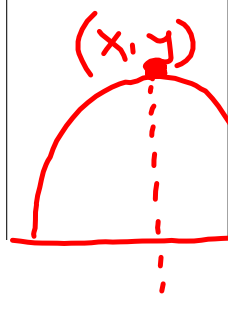
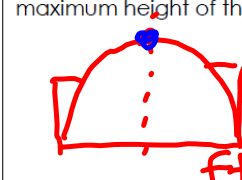
<p>16. Create equations given characteristics</p>	<p>Determine the best form to represent the given characteristics</p>	<p>a. Given: X-intercepts of (7, 0) and (-8, 0) and graph opens up</p> $y = (x-7)(x+8)$	<p>b. Given: Vertex of (-3, -6) and graph has a maximum</p> $y = -(x+3)^2 - 6$
<p>17. Create equations given graphs</p>	<p>h = -1 k = -4</p>	<p>a.</p>  <p>Vertex Form: $y = (x-1)^2 - 4$ Intercept Form: $y = (x+1)(x-3)$ Standard Form: $y = x^2 - 2x - 3$</p>	<p>b.</p>  <p>Vertex Form: $y = -(x-4)^2 + 4$ Intercept Form: $y = (x-2)(x-6)$ Standard Form: $y = -x^2 + 8x - 12$</p>

Handwritten work for problem 17:

$$-x + 2$$

x	-x²	2x
-6	6x	-12

$$-x^2 + 8x - 12$$

<p>18. Applications of the Vertex</p> 	<p>Maximum/Minimum indicate finding the vertex.</p> <p>Describe what you know about your equation before completing any solving.</p> <p>Interpret the vertex in terms of what x and y represent.</p>	<p>a. The height in feet of a rocket after x second is given by $y = -16x^2 + 128x$. What is the <u>maximum height</u> reached by the rocket and <u>how long</u> does it take to reach that height?</p> <p>$a = -16$ $b = 128$</p> <p>$x = \frac{-b}{2a}$</p> <p>$x = \frac{-128}{2(-16)} = 4 \text{ sec}$</p> <p>$f(4) = -16(4)^2 + 128(4)$</p> <p>$f(4) = 256 \text{ ft}$</p>	<p>b. The arch of bridge is modeled by the equation $y = -\frac{1}{4}(x - 50)^2 + 95$, where x represent the horizontal distance (in feet) and y represents the vertical distance (in feet). What is the maximum height of the arch?</p>  <p>$V = (50, 95)$</p>
		<p>It took 4 seconds for the rocket to reach its maximum height of 256ft.</p>	<p>The maximum height of the arch is 95ft.</p>

c.

You run a canoe rental business on a small river in Georgia. You currently charge \$12 per hour canoe and average 36 rentals a day. An industry journal says that for every fifty cent increase in rental price, the average business can expect to lose two rentals a day.

a. Use this information to attempt to maximize your income. What should you charge?

Price \$	Number of Rentals	Revenue
13	32	416
12.50	34	425
\$12	36	432
11.50	38	437
11	40	440
10.50	42	441
10.00	44	440
9.50	46	437

If you charge \$10.50, you will maximize your revenue to \$441

19. Comparing Quadratic Functions

a. Which representation has the greater y-intercept:

A. $y = x^2 + 6x - 2$
 y-int: $(0, -2)$

B.

X	-3	-2	-1	0	1
Y	-2	-5	-6	-5	-2

 y-int: $(0, -5)$

C. $y = (x+3)(x-1)$

	x	$+3$
x	x^2	$3x$
-1	$-x$	-3

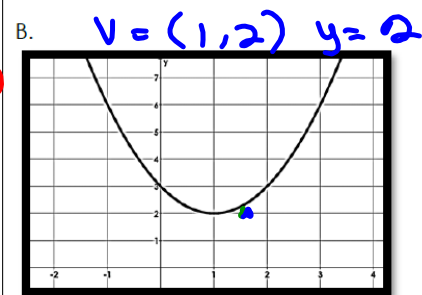
$y = x^2 + 2x - 3$
 y-int: $(0, -3)$

b. What representation has the smallest minimum value?

A. $V = (1, -3)$

x	-1	0	1	2
y	1	-2	-3	-2

 $y = -3$

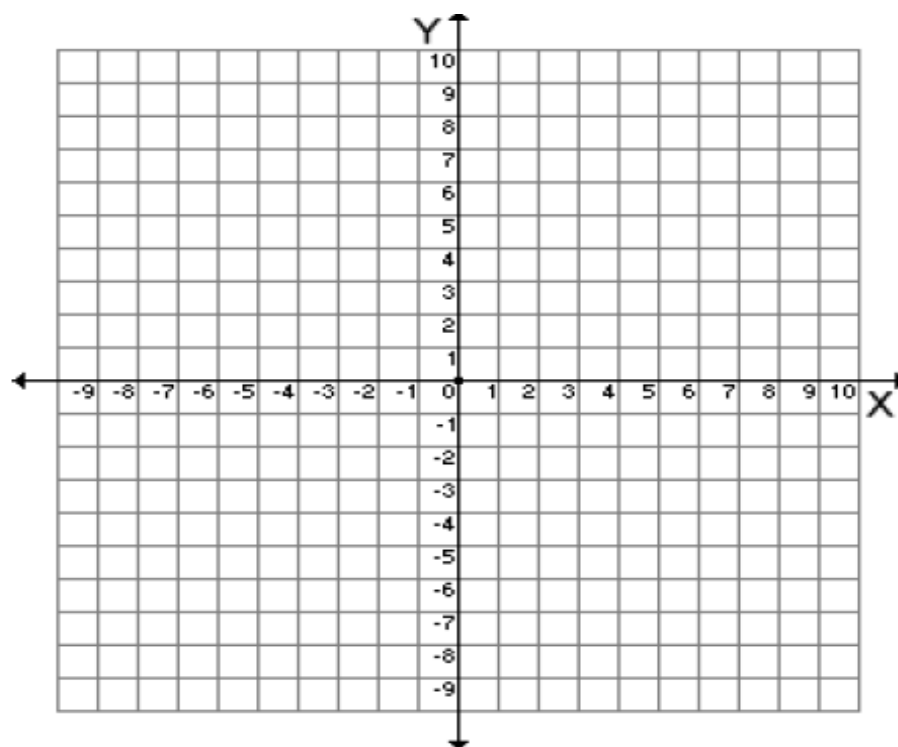


C. $y = x^2 - 2x + 6$ $y = 5$
 $x = \frac{-b}{2a} = \frac{-(-2)}{2(1)}$
 $x = 1$
 $y = 5$ $V = (1, 5)$

Post-It Check 1

Graph the following Inequality
(Show your work)

$$x^2 - 1x - 20 < 0$$



Points Up or Down, Why? _____

Vertex: _____

Roots: _____

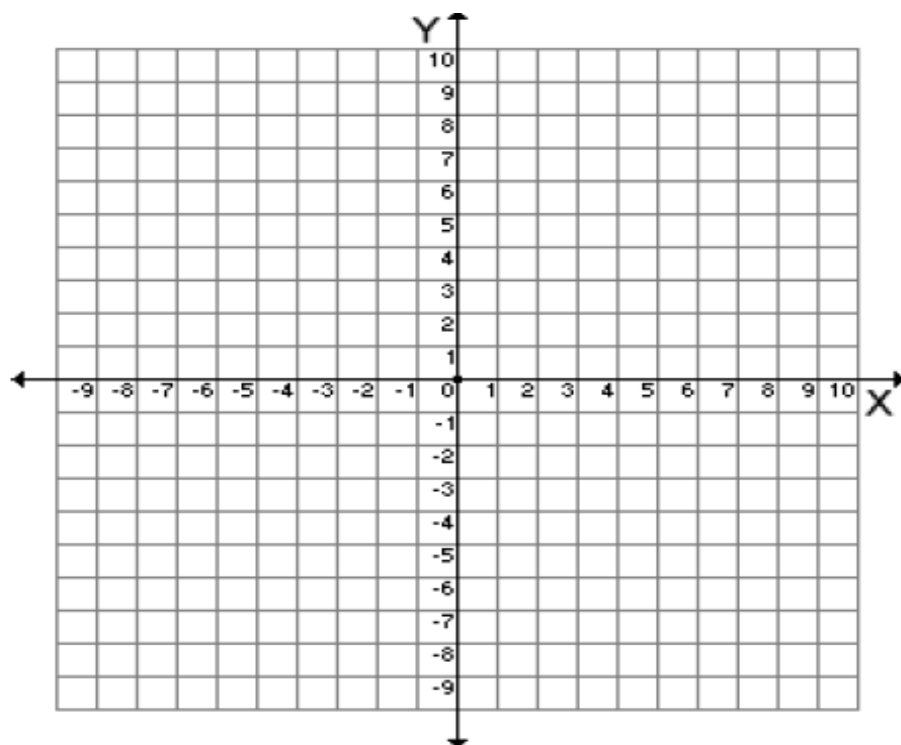
Solutions: _____

Post-It Check 2

Graph the following Inequality

(Show your work)

$$3x^2 + 2x - 8 \leq 0$$



Points Up or Down, Why? _____

Vertex: _____

Roots: _____

Solutions: _____

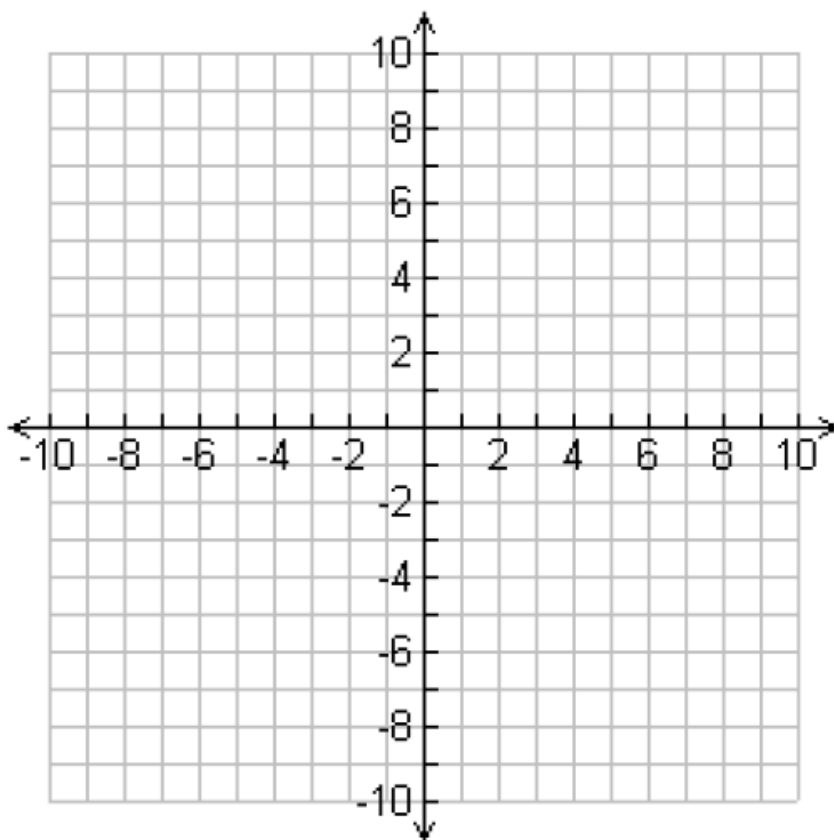
Class Work/HW Practice 3/13/18

1. $4x^2 - 5x - 24 > y$ equation.

_____ factor.

_____ roots

_____ vertex.



Test Point: _____

Evaluate Test Point: _____

Give three Possible Solutions: _____

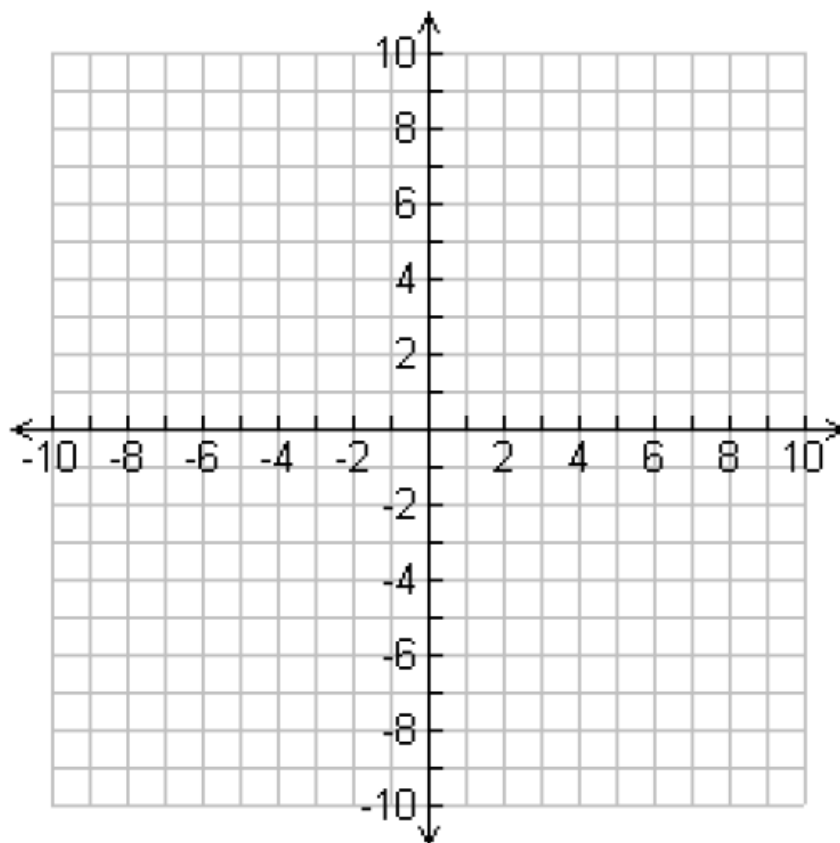


2. $x^2 - 8x + 7 \leq y$ equation.

_____ factor.

_____ roots

_____ vertex.



Test Point: _____

Evaluate Test Point: _____

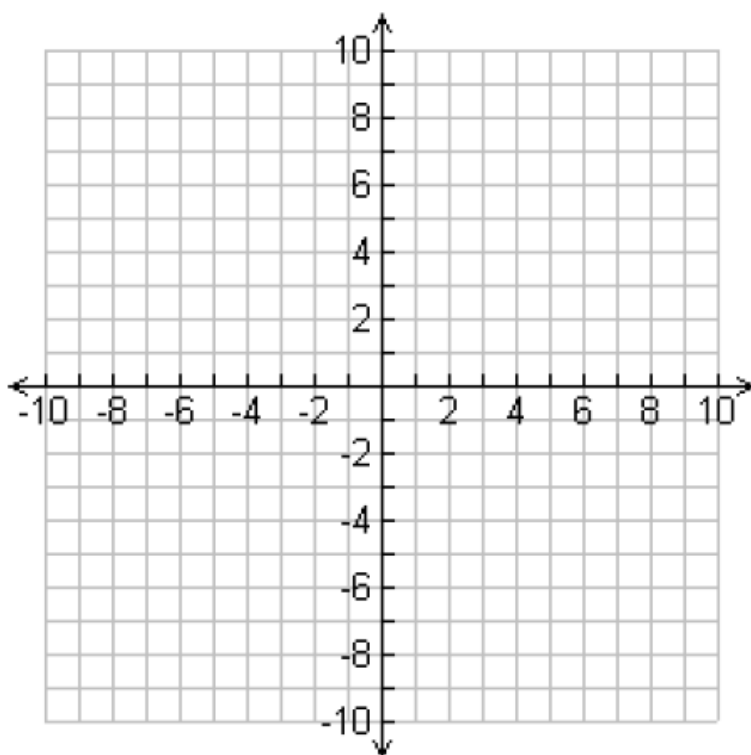
Give three Possible Solutions: _____

3. $x^2 + 12x + 35 \geq y$ equation.

_____ factor.

_____ roots

_____ vertex.



Test Point: _____

Evaluate Test Point: _____

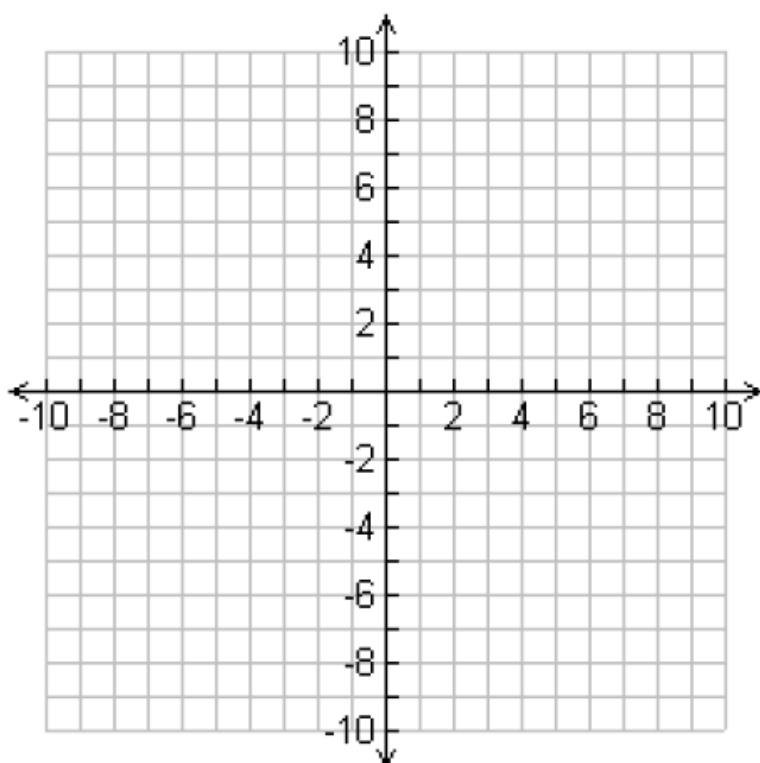
Give three Possible Solutions: _____

4. $2x^2 + 2x - 24 \leq y$ equation.

_____ factor.

_____ roots

_____ vertex.



Test Point: _____

Evaluate Test Point: _____

Give three Possible Solutions: _____
