

1. Using the points $(-8, 1)$ and $(4, -2)$, determine the following:

$$\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \quad d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

A. Midpoint

$$\frac{-8 + 4}{2}, \frac{1 + (-2)}{2}$$

$$(-2, -0.5)$$

B. Distance

$$d = \sqrt{(4 - (-8))^2 + (-2 - 1)^2}$$

$$d = \sqrt{(12)^2 + (-3)^2}$$

$$d = \sqrt{153} \approx 12.4$$

$$d = \sqrt{9 \cdot 17} \approx 3\sqrt{17} \quad \sqrt{9 \cdot 17}$$

C. Equation of the line in slope-intercept form. $3\sqrt{17}$

$$m = \frac{-2 - 1}{4 - (-8)} = \frac{-3}{12} = -\frac{1}{4}$$

$$y = -\frac{1}{4}x - 3$$

$$y = mx + b$$

$$-1 = \frac{1}{4}(-8) + b$$

$$-1 = 2 + b$$

$$-2 - 2$$

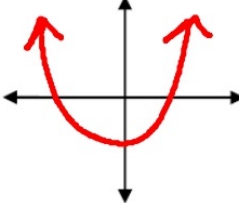
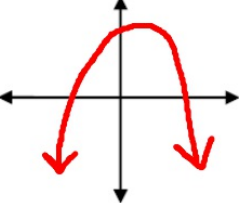
$$-3 = b$$


2. Factor completely: $\frac{8x^2}{4} - \frac{36y^2}{4}$

$$4(2x^2 - 9y^2)$$

Intro to Quadratic Equations



Main Ideas/Questions	Notes
Standard Form	<p>All quadratic equations are written in the form:</p> $y = ax^2 + bx + c$
Graph	<p>When graphed, a quadratic equation creates a U-shaped curve called a <u>parabola</u>.</p>
Types of Parabolas	<p>Use your graphing calculator to sketch the following:</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> $y = x^2 + 2x - 5$  </div> <div style="text-align: center;"> $y = -x^2 + 3x + 7$  </div> </div>
minimum-->	<ul style="list-style-type: none"> If 'a' is <u>positive</u>, then the parabola opens <u>up</u>, like a smile 😊
maximum-->	<ul style="list-style-type: none"> If 'a' is <u>negative</u>, then the parabola opens <u>down</u>, like a frown 😞

<p>Axis of Symmetry AOS</p>	<p>a vertical line through the vertex that divides the parabola into two equal parts</p> <p>Formula for the axis of symmetry: $x = \frac{-b}{2a}$</p>
<p>Vertex</p>	<p>the turning point of the parabola</p> <ul style="list-style-type: none"> • When the vertex is the <u>lowest point</u>, it is called a <u>minimum</u> • When the vertex is the <u>highest point</u>, it is called a <u>maximum</u>
<p>Examples 1. $y = x^2 + 8x + 15$ $a = \underline{1}$</p>	<p>Axis of Symmetry: $X = -4$ Vertex: $(-4, -1)$ Sketch:</p> <p>$X = \frac{-8}{2(1)} = \frac{-8}{2}$ $y = (-4)^2 + 8(-4) + 15$</p> 

$b = \underline{8}$

Y-Intercept (c-value): $(0, 15)$

$c = \underline{15}$

Domain: all real #s Range: $y \geq -1$

Increasing Interval: $y > -4$

Decreasing Interval: $y < -4$

Case #2: "A" Value is Negative

2. $y = -x^2 + 10x - 23$	Axis of Symmetry: $X = 5$	Vertex: $(5, 2)$	Sketch:
$X = \frac{-10}{2(-1)} = \frac{-10}{-2}$	$y = -(5)^2 + 10(5) - 23$	$y = 2$	

$a = \underline{-1}$

$b = \underline{10}$

$c = \underline{-23}$

Y-Intercept (c-value): $(\underline{0}, \underline{-23})$

Domain: all real #s Range: $\underline{y \leq 2}$

Increasing Interval: $\underline{y < 5}$

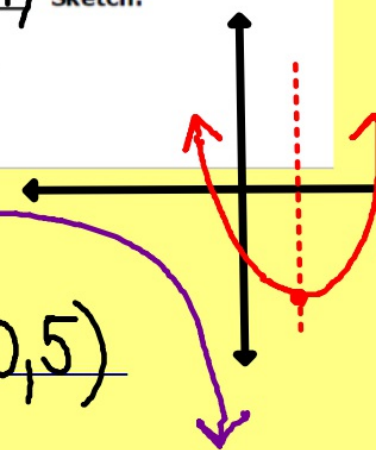
Decreasing Interval: $\underline{y > 5}$

Case #3: "A" Value $\neq 1$

3. $y = 3x^2 - 12x + 5$	Axis of Symmetry: $X=2$	Vertex: $(2, -7)$	Sketch:
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$$X = \frac{12}{2(3)} = \frac{12}{6} \quad y = 3(2)^2 - 12(2) + 5$$

$$y = -7$$



$a = \underline{3}$

$b = \underline{-12}$

$c = \underline{5}$

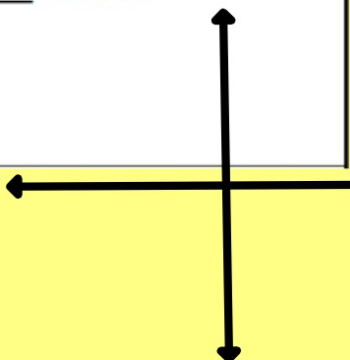
Y-Intercept (c-value): $\underline{(0, 5)}$

Domain: all Real #s Range: $y \geq \underline{-7}$
↳ up

Increasing Interval: $\underline{y > 2}$

Decreasing Interval: $\underline{y < 2}$

Case #4: No "C" Value

8. $y = -x^2 + 4x$	Axis of Symmetry: _____ Vertex: _____ Sketch: 
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$a =$ _____

Y-Intercept (c-value): _____

$b =$ _____

Domain: _____ Range: _____

$c =$ _____

Increasing Interval: _____

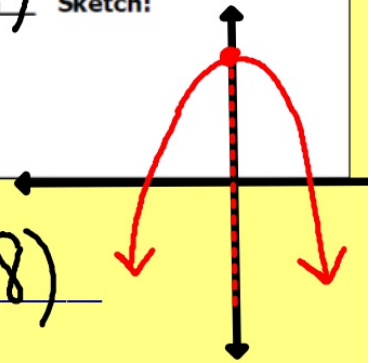
Decreasing Interval: _____

Case #5: No "B" Value

10. $y = -2x^2 + 8$

Axis of Symmetry: $X=0$ Vertex: $(0, 8)$ Sketch:

$$X = \frac{-0}{2(-2)} \quad Y = -2(0)^2 + 8$$
$$Y = 8$$



$a = -2$

$b = 0$

$c = 8$

Y-Intercept (c-value): $(0, 8)$

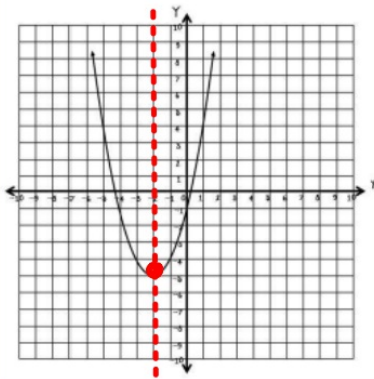
Domain: all real #s Range: $y \leq 8$

Increasing Interval: $y < 0$

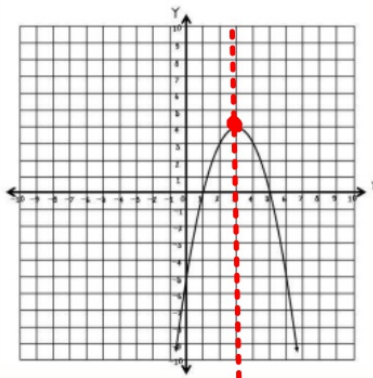
Decreasing Interval: $y > 0$

Analyzing Quadratic Graphs

GRAPH A



GRAPH B



Answer the questions given the graphs above.

1. What is the axis of symmetry for Graph A?

$$X = -2$$

2. What is the axis of symmetry for Graph B?

$$X = 3$$

3. What is the vertex of Graph A?

$$(-2, -5)$$

Maximum or Minimum?

min.

4. What is the vertex of Graph B?

$$(3, 4)$$

Maximum or Minimum?

max

5. Identify the domain and range of Graph A.

d: all Real #s

R: $y \geq -5$

6. Identify the domain and range of Graph B.

d: all Real #s

r: $y \leq 4$

7. Identify the equation for Graph A.

A. $y = x^2 - 4x - 1$

~~C. $y = x^2 - 4x - 1$~~

B. $y = x^2 + 4x - 1$

~~D. $y = x^2 + 4x - 1$~~

$$\frac{4}{2(1)} = 2$$

8. Identify the equation for Graph B:

~~A. $y = x^2 - 6x - 5$~~

~~C. $y = x^2 - 6x - 5$~~

~~B. $y = x^2 + 6x - 5$~~

D. $y = -x^2 + 6x - 5$

$$\frac{6}{2(-1)} = -3$$