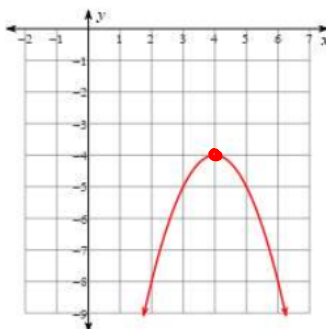


Name: _____ Algebra 10 Unit 8 Lesson 3

The Shifted Form of a Parabola

DO NOW ~ Monday 1/6

Identify the vertex (turning point):



$$\begin{matrix} x & y \\ (4, -4) \end{matrix}$$



Classwork

Standard Form of a Parabola: $y = ax^2 + bx + c$

Example:

$$y = 2x^2 + 3x + 4$$

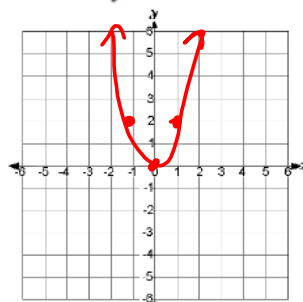
Vertex Form of a Parabola: $y = (x - h)^2 + k$

Example:

$$y = (x + 4)^2 + 2$$

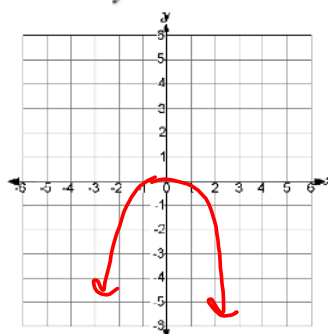
 (h, k) is the vertex (turning point) of the parabola

$$y = 2x^2 + 0$$



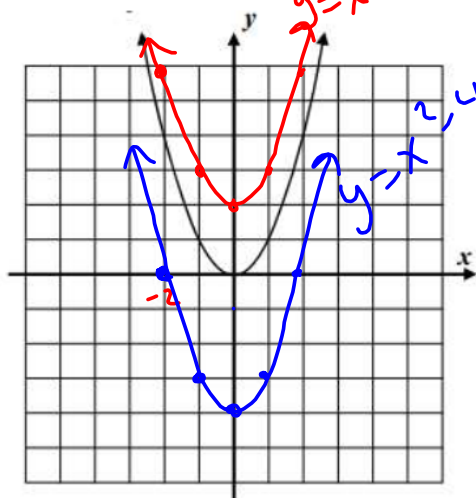
x	y
-2	8
-1	2
0	0
1	2
2	8

$$y = -3x^2 + 0$$



Lesson continues onto the next page.

Exercise #3: The parabola $y = x^2$ is again shown on the grid below. Consider the quadratic function $y = x^2 + 2$ and $y = x^2 - 4$.



$$y = x^2 + 2$$

x	y
-2	6
-1	3
0	2
1	3
2	6

$$y = x^2 - 4$$

x	y
-2	0
-1	-3
0	-4
1	-3
2	0

(a) Using your calculator to generate tables, sketch these two quadratics and label.

(b) What was the effect of adding a constant to the overall function?

(c) State the coordinates of the turning points of each of the parabola you drew in (a).

$$y = x^2 + 2 \quad (0, 2) \quad y = x^2 - 4 \quad (0, -4)$$

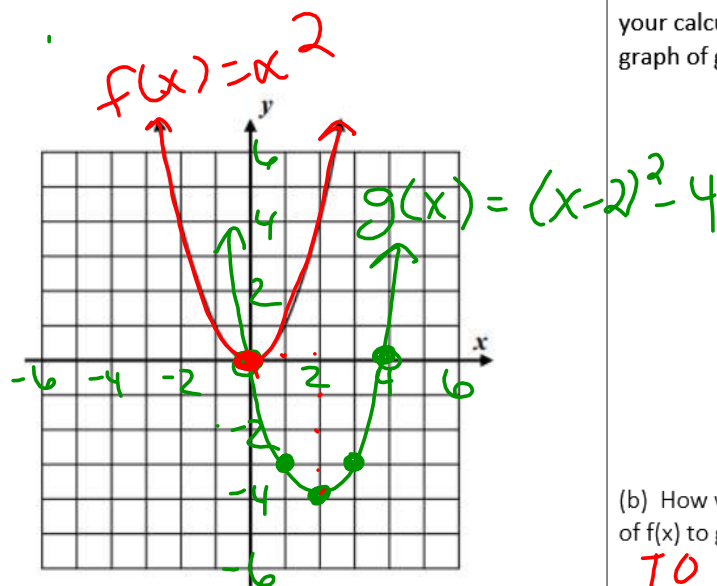
(d) What would the coordinates of the turning point of the parabola $y = x^2 - 150$ be?

$$(0, -150)$$

DO NOW ~ Tuesday 1/7

Identify the vertex (turning point) of $y = x^2 - 8x + 20$. $(4, 4)$ 

Classwork

The graph of $f(x) = x^2$ is shown on the grid already.(a) Now consider $g(x) = (x-2)^2 - 4$. Using your calculator to generate a table, sketch a graph of g .

x	y
0	0
1	-3
2	-4
3	-3
4	0

(b) How would you need to shift the graph of $f(x)$ to get the graph of $g(x)$?

TO the right 2 space.
Then down 4 space.

(c) What is the turning point of $g(x)$? $(2, -4)$

(d) Where do you "see" the turning point in the equation?

DO NOW ~ Wednesday 1/8

Explain in your own words what "maximum" means:

Highest / Greatest

Explain in your own words what "minimum" means:

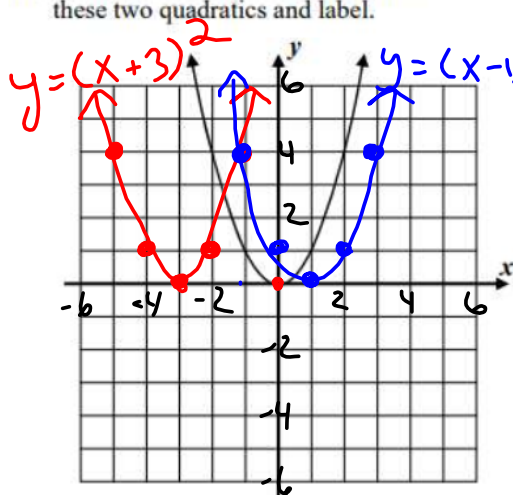
Lowest / Least



Classwork

Exercise #4: Yet (again), the parabola $y = x^2$ is graphed below. Now consider $y = (x+3)^2$ and $y = (x-1)^2$.

- (a) Using your calculator to generate tables, sketch these two quadratics and label.



$$y = (x+3)^2$$

x	y
-4	1
-3	0
-2	1
-1	4

$$y = (x-1)^2$$

x	y
-1	4
0	1
1	0
2	1
3	4

- (b) Why is the horizontal shift counterintuitive?

- (c) State the coordinates of the turning points of each of the parabola you drew in (a). Vertex

$$y = (x+3)^2 + 0$$

$$(-3, 0)$$

$$y = (x-1)^2 + 0$$

$$(1, 0)$$

- (d) Determine the coordinate of the turning points of each of the following quadratics. Note that the value of a is irrelevant. Vertex

$$y = (x-8)^2 + 5$$

$$(8, 5)$$

$$y = 5(x+1)^2 - 4$$

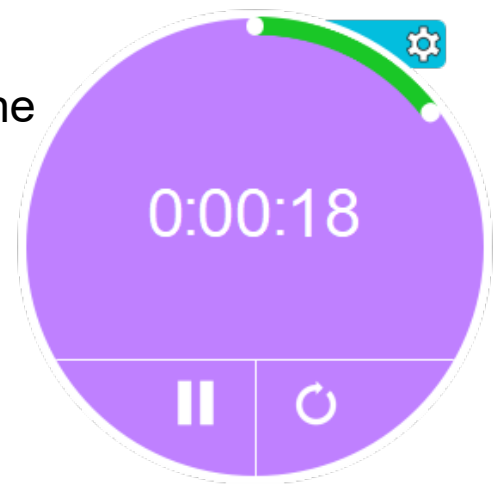
$$(-1, -4)$$

$$y = -2(x-3)^2 - 10$$

$$(3, -10)$$

To earn your full participation point for the Do Now be sure to have completed all of the following by the time is up:

- 1) Be in your seat
- 2) Take out your calculator or grab one
- 3) Have last night's homework out
- 4) Complete the do now



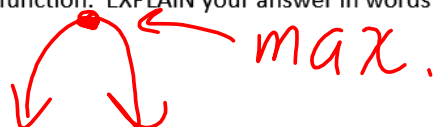
DO NOW ~ Thursday 1/9

Given the function $f(x) = 2x^2 + 6x + 3$, state whether the vertex represents a maximum or minimum point for the function. EXPLAIN your answer in words or using a sketch.



Classwork

Given the function $f(x) = -x^2 + 4x - 1$, state whether the vertex represents a maximum or minimum point for the function. EXPLAIN your answer in words or using a sketch.



Given the function $f(x) = x^2 - 8x + 12$, state whether the vertex represents a maximum or minimum point for the function. EXPLAIN your answer in words or using a sketch.



Given the function $f(x) = -x^2 - 6x - 12$, state whether the vertex represents a maximum or minimum point for the function. EXPLAIN your answer in words or using a sketch.



Given the function $f(x) = -2x^2 - 12x - 20$, state whether the vertex represents a maximum or minimum point for the function. EXPLAIN your answer in words or using a sketch.



Mrs. Ferreri's Station ~ Vertex Form

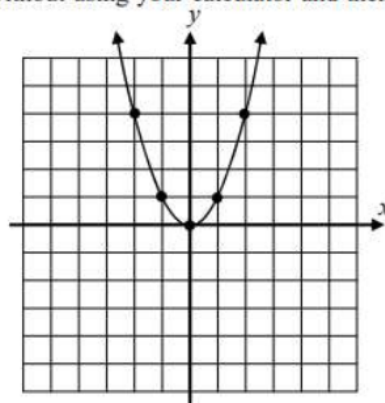
1. The grid below shows the graph of $y = x^2$ with particular points emphasized. On the same grid, draw the following **quadratic functions**. Try to do these as best as possible without using your calculator and then check your answers. Label each with its letter or equation.

(a) $y = x^2 - 6$

(b) $y = x^2 + 1$

(c) $y = (x+3)^2$

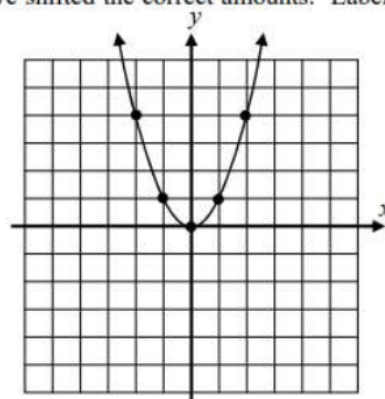
(d) $y = (x-4)^2$



2. Again, the function $y = x^2$ is shown below. Graph each of the following more complicated quadratics without the use of your calculator. Then, use it to check that you have shifted the correct amounts. Label each with its letter or equation.

(a) $y = (x-1)^2 - 4$

(b) $y = (x+3)^2 - 1$



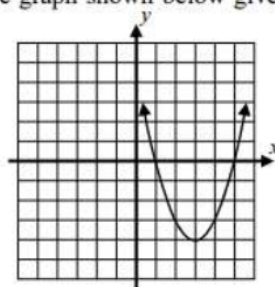
3. Which of the following equations represents the graph shown below given that it is a shift of the function $y = x^2$. Explain your choice.

(1) $y = (x-3)^2 - 4$

(2) $y = (x+3)^2 - 4$

(3) $y = (x-3)^2 + 4$

(4) $y = (x+3)^2 + 4$



Continue onto next page.

What are the coordinates of the minimum point of the quadratic equation $y = x^2 + 5x - 2$? _____

What are the coordinates of the maximum point of the quadratic equation $y = -3x^2 - 2x + 9$? _____

Given the graph of the parabola represented by the equation $f(x) = x^2$, if a constant of +2 is added to the equation, the graph of the new parabola would be shifted 2 units _____

Can you compare two functions on one graph? For example, let's graph $f(x) = 5(x - 3)^2 + 2$ and $g(x) = x^2$

Will the following parabola shift up, down, to the left or to the right? _____ $f(x) = -3x^2 - 5$

Identify the turning point (vertex) of the following quadratic function. _____ $g(x) = (x - 2)^2 + 6$

****Remember, NEGATIVE ($y = -x^2 + 2$) the parabola opens DOWN like a FROWN.**

POSITIVE ($y = x^2 + 2$) the parabola opens UP like a SMILE.

Go over all HOMEWORK from LAST packet and CURRENT packet

Computer Station ~ *Delta Math*

Complete the “Vertex Form” assignment.

Mrs. Kennedy's Station ~ Vertex Form and Identifying the Vertex

State the turning points for each of the following quadratic functions and state whether the parabola opens upwards or downwards. Remember, the direction it opens only depends on the leading coefficient.

(a) $y = 4(x - 2)^2 + 7$

(b) $y = -3(x + 6)^2 + 4$

(c) $y = -(x + 4)^2 - 3$

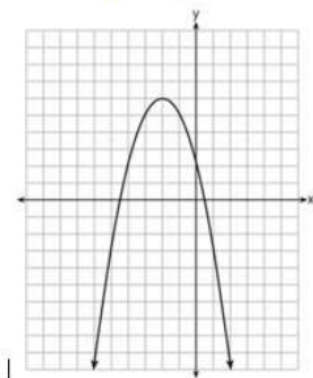
(d) $y = \frac{1}{2}(x + 1)^2 - 7$

(e) $y = 9 - x^2$

(f) $y = -16(x - 5)^2 + 11$

Now go back to the above problems and state whether they have a minimum or maximum. How can you tell just by looking at the equation?

What are the coordinates of the vertex and the equation of the axis of symmetry of the parabola shown in the graph below?



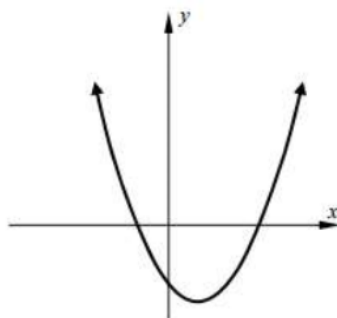
Which of the following could be the equation of the quadratic shown below? Explain your reasoning.

(1) $y = -3x^2 + 8x - 5$

(2) $y = 4x^2 - 6x + 7$

(3) $y = -2x^2 + 12x + 11$

(4) $y = x^2 - 8x - 2$



Continue onto next page.

Identify the vertex (turning point) of each quadratic function. Check on your graphing calculator using the graphing and table options to check your answers.

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

2) $y = -2(x - 1)^2 - 1$

3) $y = (x - 1)^2 - 2$

4) $y = 2(x - 2)^2 - 3$

5) $y = -(x + 3)^2 + 2$

6) $y = -2(x - 3)^2 + 1$

7) $y = -(x - 2)^2 - 1$

8) $y = (x - 3)^2 + 4$

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

10) $y = (x - 3)^2 + 2$

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

2) $f(x) = (x - 4)^2 - 1$

$f(x) = (x - 4)^2 + 4$

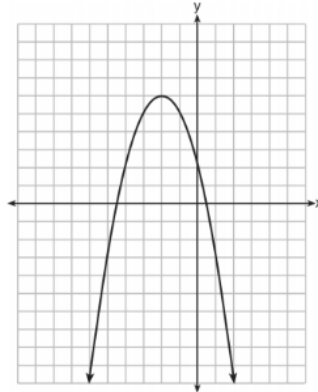
4) $f(x) = 2(x + 3)^2 + 3$

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

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

Homework ~ Monday 1/6

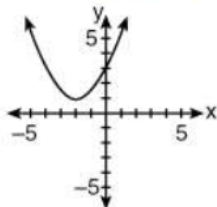
1. What are the coordinates of the vertex and the equation of the axis of symmetry of the parabola shown in the graph below?



- A. $(0, 2)$ and $y = 2$ B. $(0, 2)$ and $x = 2$ C. $(-2, 6)$ and $y = -2$ D. $(-2, 6)$ and $x = -2$
2. What is the equation of a parabola that goes through points $(0, 1)$, $(-1, 6)$, and $(2, 3)$?

- A. $y = x^2 + 1$ B. $y = 2x^2 + 1$ C. $y = x^2 - 3x + 1$ D. $y = 2x^2 - 3x + 1$

3. The accompanying diagram shows a parabola.



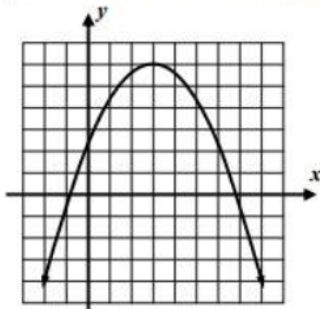
Which statement is *not* true?

- A. The equation of the axis of symmetry is $x = -2$. B. The parabola has a minimum point.
C. The turning point of the parabola is $(-2, 1)$. D. The parabola has two x -intercepts.
4. Which point is on the graph of the parabola whose equation is $y = 2x^2 - 3x + 4$?
- A. $(0, 3)$ B. $(3, 0)$ C. $(4, 0)$ D. $(0, 4)$

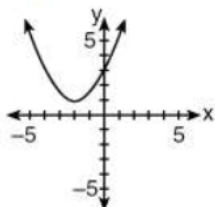
Homework ~ Tuesday 1/7

1. For the quadratic function shown below, the coordinates of its vertex are

- (1) $(0, 2)$
- (2) $(-1, 7)$
- (3) $(6, 2)$
- (4) $(3, 6)$



The accompanying diagram shows a parabola.



Which statement is *not* true?

- A. The equation of the axis of symmetry is $x = -2$.
- B. The parabola has a minimum point.
- C. The turning point of the parabola is $(-2, 1)$.
- D. The parabola has two x -intercepts.

Which of the following is the turning point of the function $y = (x - 8)^2 - 2$?

- (1) $(8, -2)$
- (2) $(-8, 2)$
- (3) $(-8, -2)$
- (4) $(8, 2)$

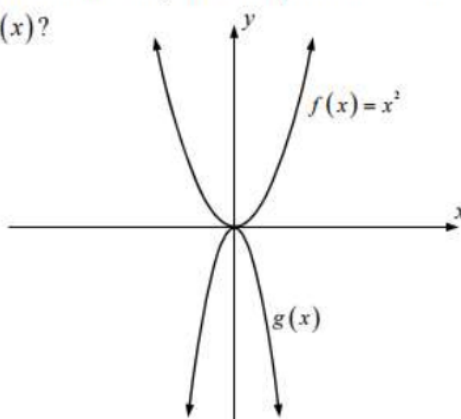
Homework ~ Wednesday 1/8

Which of the following represents the range of the function $g(x) = -3(x+5)^2 + 10$?

- (1) $y > 10$ (3) $y \leq 10$
(2) $y > -15$ (4) $y \leq 15$

If the quadratic function $f(x) = x^2$ is graphed below along with the quadratic function $g(x)$, which of the following could be a correct equation for $g(x)$?

- (1) $g(x) = 2x^2$
(2) $g(x) = -2x^2$
(3) $g(x) = \frac{1}{2}x^2$
(4) $g(x) = -\frac{1}{2}x^2$

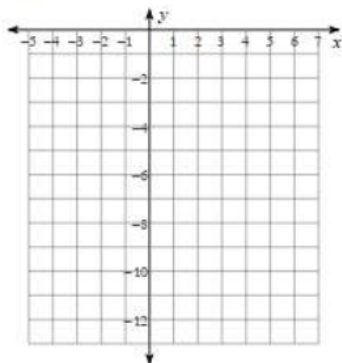


Which of the following represents the turning point of the quadratic function $y = x^2 + 10x + 35$?

- (1) $(-3, 20)$ (3) $(-5, 10)$
(2) $(5, 110)$ (4) $(3, 74)$

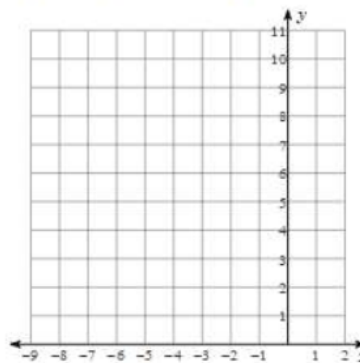
Name: _____ Parabolas Graded Classwork

1) $y = -2x^2 + 4x - 6$



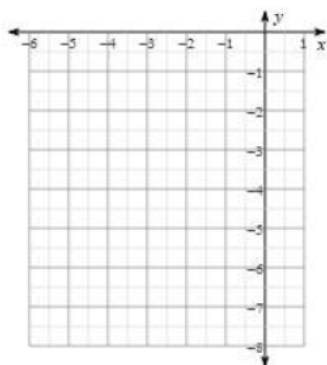
- a) Graph the Quadratic Function
- b) Identify the Range: _____
- c) Identify the turning point: _____
- d) Draw and state the axis of symmetry: _____
- e) Circle the roots of the parabola

2) $y = 2x^2 + 16x + 34$



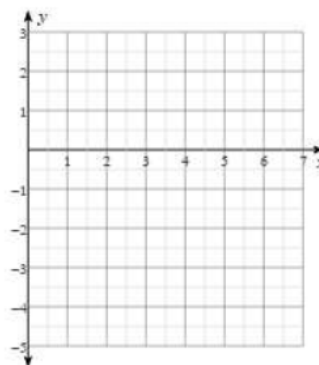
- a) Graph the Quadratic Function
- b) Identify the Range: _____
- c) Identify the turning point: _____
- d) Draw and state the axis of symmetry: _____
- e) Circle the roots of the parabola

3) $y = -x^2 - 8x - 19$



- a) Graph the Quadratic Function
- b) Identify the Range: _____
- c) Identify the turning point: _____
- d) Draw and state the axis of symmetry: _____
- e) Circle the roots of the parabola

4) $y = x^2 - 8x + 13$



- a) Graph the Quadratic Function
- b) Identify the Range: _____
- c) Identify the turning point: _____
- d) Draw and state the axis of symmetry: _____
- e) Circle the roots of the parabola