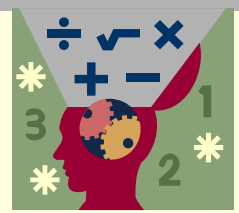


Quadratics

Practice

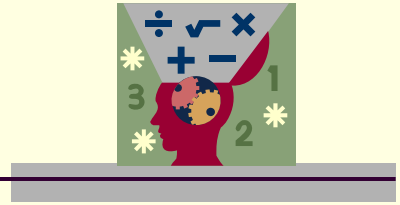
Graphing Quadratic Functions

Vertex Form of a Quadratic

Finding the Vertex Form of a Quadratic Using the Zeros

Solving Equations Using Square Roots

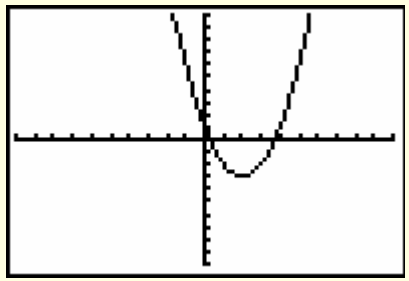
Graphing Quadratic Functions



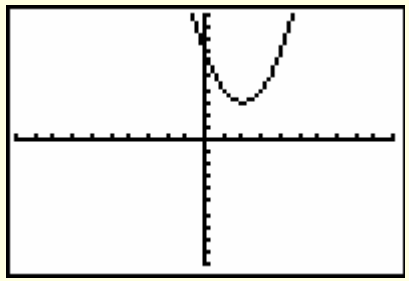
Problem #1: Graph the quadratic function on a piece of graph paper and state the letter of the correct answer.

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

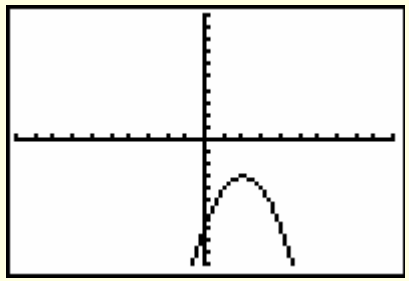
A.



B.



C.



D.

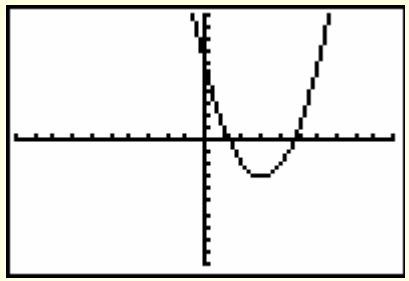


Table of Values

x	$(x-2)^2-3$	y
-2	$(-2-2)^2-3$	?
-1	$(-1-2)^2-3$	?
0	$(0-2)^2-3$	?
1	$(1-2)^2-3$	?
2	$(2-2)^2-3$	?
3	$(3-2)^2-3$	?
4	$(4-2)^2-3$	?

Hint:

Step 1: Make a table of values using positive and negative x-values.

Step 2: Graph the points on a coordinate plane.

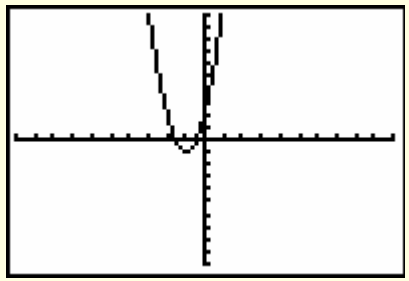
Step 3: Connect the points using a curve (remember that parabolas are curved).

Graphing Quadratic Functions

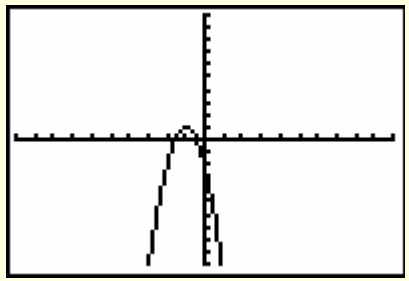
Problem #2: Graph the quadratic function on a piece of graph paper and state the letter of the correct answer.

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

A.



B.



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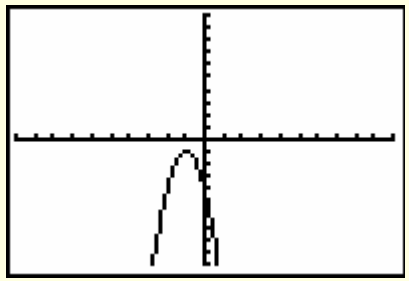


D.

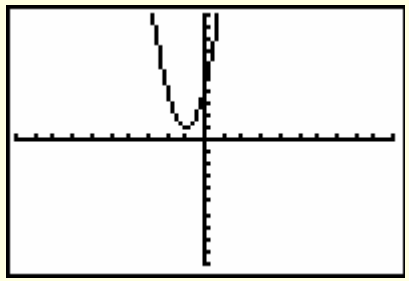


Table of Values

x	$-3(x+1)^2-1$	y
-2	$-3(-2+1)^2-1$	?
-1	$-3(-1+1)^2-1$	?
0	$-3(0+1)^2-1$	?
1	$-3(1+1)^2-1$	?
2	$-3(2+1)^2-1$	?

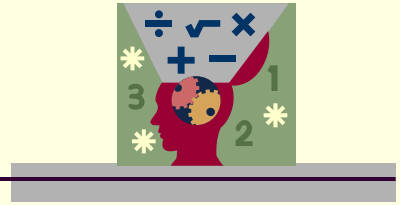
Hint:

Step 1: Make a table of values using positive and negative x-values.

Step 2: Graph the points on a coordinate plane.

Step 3: Connect the points using a curve (remember that parabolas are curved).

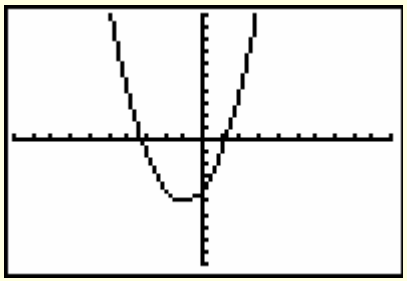
Graphing Quadratic Functions



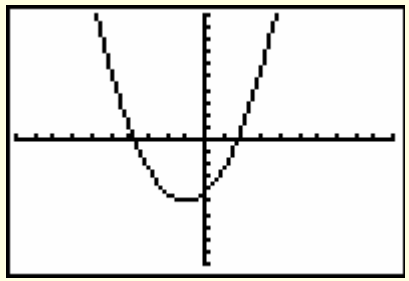
Problem #3: Graph the quadratic function on a piece of graph paper and state the letter of the correct answer.

$$y = \frac{2}{3}(x+1)^2 - 5$$

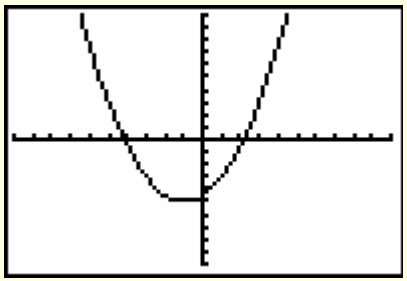
A.



B.



C.



D.

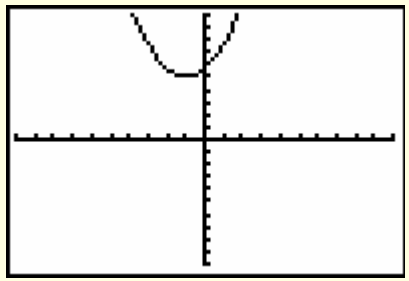


Table of Values

x	$y = \frac{2}{3}(x+1)^2 - 5$	y
-4	$y = \frac{2}{3}(-4+1)^2 - 5$	?
-1	$y = \frac{2}{3}(-1+1)^2 - 5$	?
2	$y = \frac{2}{3}(2+1)^2 - 5$	?
5	$y = \frac{2}{3}(5+1)^2 - 5$	?

Hint:

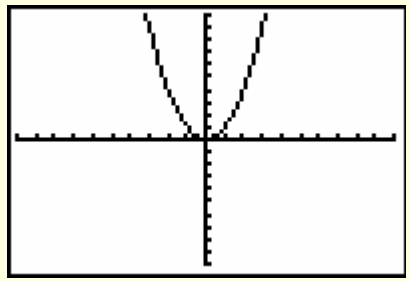
Step 1: Make a table of values using positive and negative x-values.

Step 2: Graph the points on a coordinate plane.

Step 3: Connect the points using a curve (remember that parabolas are curved).

Graphing Quadratic Functions

For the next three problems, compare the graphs of the following functions to the graph of the function to the right. Describe the horizontal and the vertical translations of the vertex.



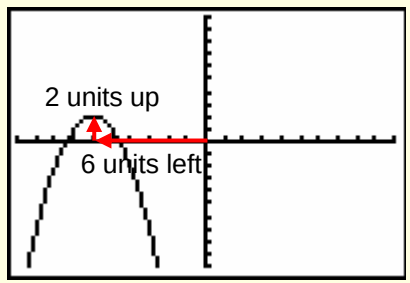
$y = x^2$

Problem #4: Describe the horizontal and the vertical translations of the vertex. $y = -(x+2)^2 + 5$

Problem #5: Describe the horizontal and the vertical translations of the vertex. $y = -\frac{1}{2}(x+3)^2 - 12$

Problem #6: Describe the horizontal and the vertical translations of the vertex. $y = 2(x-4)^2 + 7$

Hint for Problems #4, #5, and #6: The graph shown to the right is an EXAMPLE of a horizontal and vertical translation of the vertex of the quadratic function $y = -(x+6)^2 + 2$ compared to the quadratic function $y = x^2$.



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

The vertex is:

translated 6 units left

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

(note: moves opposite direction)

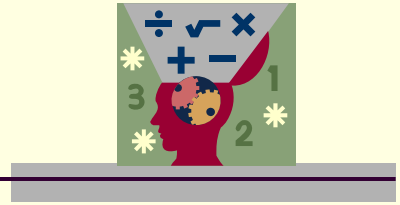
$y = -(x+6)^2 + 2$

and 2 units up

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

and opens downward.

Vertex Form of a Quadratic



Vertex Form

The vertex form of a quadratic function is $y = a(x-h)^2 + k$, where (h, k) is the vertex and $x = h$ is the axis of symmetry. When "a" is positive, the parabola opens up and the vertex is the minimum value. When "a" is negative, the parabola opens down and the vertex is the maximum value.

Find the direction of opening, vertex, and axis of symmetry for the next three quadratic functions.

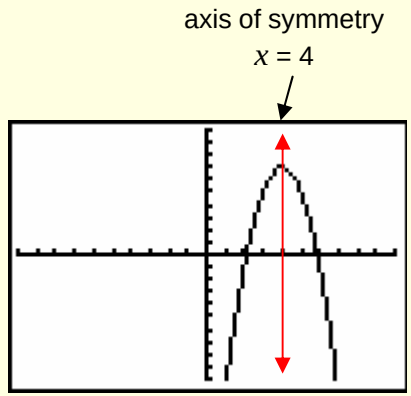
Problem #7: $y = -3(x-2)^2 + 5$ Problem #8: $y = 4(x-3)^2 - 12$ Problem #9: $y = -7(x+6)^2 + 8$

Hint for Problems #7, #8, and #9: EXAMPLE: Identify the direction of opening, vertex, and axis of symmetry for the quadratic function $y = -2(x-4)^2 + 7$.

direction of opening: down because "a" (–2) is negative.

vertex: (4, 7)

axis of symmetry: $x = 4$



Finding the Vertex Form of a Quadratic Using the Zeros

Problem #10: Use factoring to find the zeros of the function $x^2 - 2x - 15$. Then use the zeros to determine the vertex of the parabola.

Hint:

Step 1: Find the zeros by setting the function equal to 0 and factoring the trinomial.

$$x^2 - 2x - 15 = 0$$
$$(x+3)(x-5) = 0$$

Step 2: Set each binomial equal to 0 and solve for x.

$$x+3=0 \qquad x-5=0$$
$$x=-3 \qquad x=5$$

Step 3: Find the x-coordinate of the vertex by finding the midpoint of the zeros.

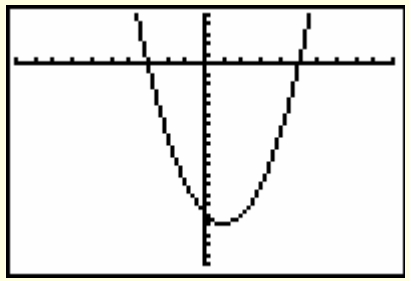
$$x = \frac{-3+5}{2}$$

$x = ?$ The x-coordinate of the vertex is ___.

Step 4: Substitute ? in the equation for x and and solve to find y, which will represent the y-coordinate of the vertex.

$$y = x^2 - 2x - 15$$
$$y = (?)^2 - 2(?) - 15$$
$$y = \_\_\_\_\_$$

The vertex of $y = x^2 - 2x - 15$ is located at (?, ?).



$x^2 - 2x - 15 = 0 \Leftrightarrow y = (x-1)^2 - 16$ (vertex form)

Finding the Vertex Form of a Quadratic Using the Zeros

Problem #11: Use factoring to find the zeros of the function $x^2 - 6x + 9$. Then use the zeros to determine the vertex of the parabola.

Problem #12: Use factoring to find the zeros of the function $x^2 - 2x - 8$. Then use the zeros to determine the vertex of the parabola.

Problem #13: Use factoring to find the zeros of the function $x^2 - 15x + 56$. Then use the zeros to determine the vertex of the parabola.

Hint for Problems #11, #12, and #13:

Step 1: Find the zeros by setting the function equal to 0 and factoring the trinomial.

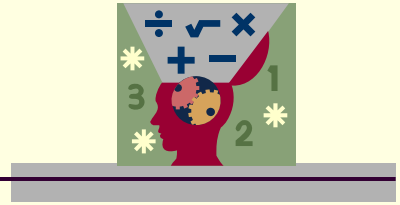
Step 2: Set each binomial equal to 0 and solve for x.

Step 3: Find the x-coordinate of the vertex by finding the midpoint of the zeros.

Step 4: Substitute ? in the equation for x and and solve to find y, which will represent the y-coordinate of the vertex.

The vertex is located at (?, ?).

Solving Equations Using Square Roots



Problem #14: Solve the equation $x^2 = 49$.

Hint for Problem #14: Take the square root of both sides to solve.

$$\sqrt{x^2} = \sqrt{49}$$

$$x = +\_\_\_\_\_ \text{ and } -\_\_\_\_\_$$

Problem #15: Solve the equation $36x^2 = 81$.

Hint for Problem #15: Divide and then take the square root of both sides to solve. Simplify if necessary.

$$\sqrt{x^2} = \sqrt{\frac{81}{36}}$$

$$x = +\frac{?}{?} \text{ and } -\frac{?}{?}$$

Problem #16: Solve the equation $(x-2)^2 - 9 = 0$.

Hint for Problem #16: Add 9 to both sides. Take the squa root of both sides to solve. Simplify if necessary.

$$(x-2)^2 - 9 + 9 = 0 + 9$$

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

$$\sqrt{(x-2)^2} = \sqrt{9}$$

$$(x-2)^2 = \pm 3$$

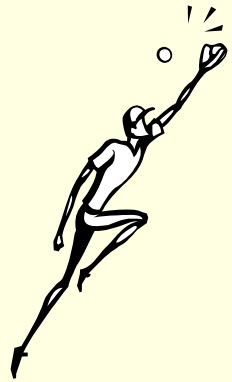
Solve the two equations.

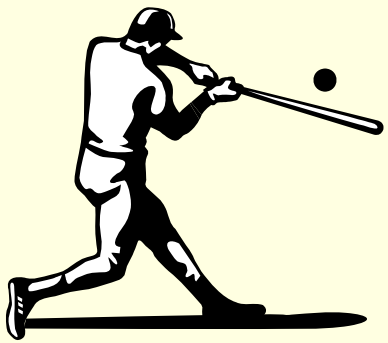
$x - 2 = 3$ *and* $x - 2 = -3$

$x = ?$ $x = ?$

Solving Equations Using Square Roots

Problem #17: A pop fly can be easily caught if it stays in the air for 7 seconds. Suppose a ball that is hit can be represented by the function $h = -16t^2 + 115t + 20$, where h is the height after t seconds. Find the height of the ball after 7 seconds. Can the ball be caught?





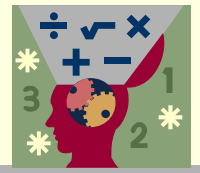
Hint for Problem #17: Substitute 7 in for t and then solve for h to determine the height of the ball after 7 seconds.

$$h = -16t^2 + 110t + 20$$

$$h = -16(7)^2 + 110(7) + 20$$

$$h = \_\_\_\_\_$$

Answers



Problem #1: Choice “A”.

Problem #2: Choice “C”.

Problem #3: Choice “B”.

Problem #4: The vertex has translated 2 units left and 5 units up.

Problem #5: The vertex has translated 3 units to the left and 12 units down.

Problem #6: The vertex has translated 4 units to the right and 7 units up.

Problem #7: down; (2, 5); $x = 2$

Problem #8: up; (3, –12); $x = 3$

Problem #9: down; (–6, 8); $x = –6$

Problem #10: (1, –16)

Problem #11: (3, 0)

Problem #12: (1, –9)

Problem #13: (15/2, –1/4)

Problem #14: +7, –7

Problem #15: 9/4, –9/4

Problem #16: +5, –1

Problem #17: 6 feet, yes