

1. Graph the equation  $y = -x^2 + 2x + 3$ . Be sure to include the vertex, intercepts, and at least two other specific points.

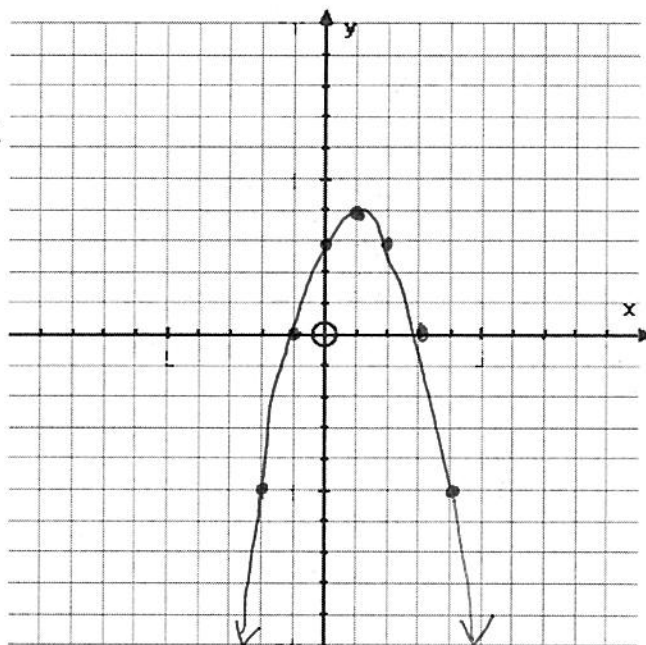
x	y	(x, y)
-2	-5	(-2, -5)
-1	0	(-1, 0)
0	3	(0, 3)
1	4	(1, 4)
2	3	(2, 3)
3	0	(3, 0)
4	-5	(4, -5)

$$\frac{-b}{2a} = \frac{-2}{2(-1)} = \frac{-2}{-2} = 1$$

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

$$y = -(1) + 2 + 3 \quad \text{vertex:}$$

$$y = -1 + 2 + 3 = 4 \quad (1, 4)$$



Now answer the following questions about the function:

- What is the name of the graph of this function? parabola
- What is the orientation (direction of opening) of the graph of this function? down
- Does this function have a minimum or maximum value (select one)? maximum
- What is the minimum or maximum value of this function? 4
- What is the y-intercept of this function? 3
- What are the coordinates of the vertex of this function? (1, 4)
- What is the equation of the axis of symmetry of this function? X = 1
- How many solutions/roots/zeros does this function have? two
- What are the x-intercepts or the solutions/roots/zeros of this function? x = -1 and 3

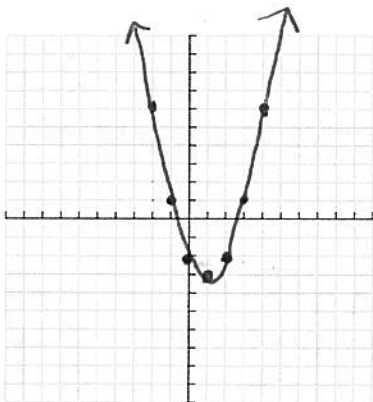
Graph the following functions.

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

x	y	(x, y)
-1	1	(-1, 1)
0	-2	(0, -2)
1	-3	(1, -3)
2	-2	(2, -2)
3	1	(3, 1)

Axis of Symmetry:  $x = 1$

Vertex:  $(1, -3)$



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

$$\frac{1 + -3}{2} = \frac{-2}{2} = -1$$

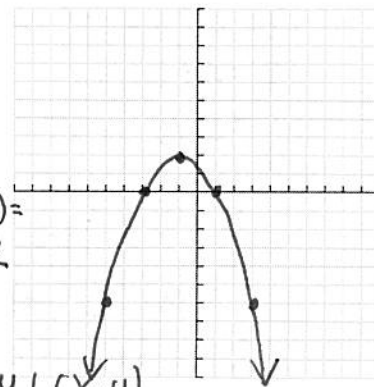
$$y = -\frac{1}{2}(-1 - 1)(-1 + 3)$$

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

X-intercepts:  $1, -3$

Axis of Symmetry:  $x = -1$

Vertex:  $(-1, 2)$



x	y	(x, y)
-5	-6	(-5, -6)
-3	0	(-3, 0)
-1	2	(-1, 2)
1	0	(1, 0)
3	-6	(3, -6)

Write the following quadratic functions in standard form.

4.  $y = 2(x+3)(x-1)$

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

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

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

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

$$y = (x+4)(x+4) - 5$$

$$y = x^2 + 4x + 4x + 16 - 5$$

$$y = x^2 + 8x + 11$$

Graph the following quadratic inequalities. Be sure to include the vertex, intercepts, and at least two other specific points.

6.  $y < -x^2 + 4x + 5$   $\frac{-4}{2(-1)} = \frac{-4}{-2} = 2$

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

$$y = -4 + 8 + 5$$

$$y = 9$$

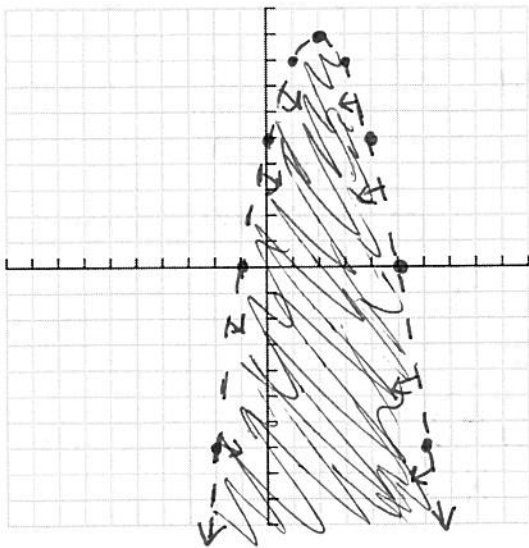
vertex: (2, 9)

x	y	(x,y)
0	5	(0,5)
1	8	(1,8)
2	9	(2,9)
3	8	(3,8)
4	5	(4,5)

Test: (0,0)

$$0 < -0^2 + 4(0) + 5$$

$$0 < 5 \checkmark$$



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

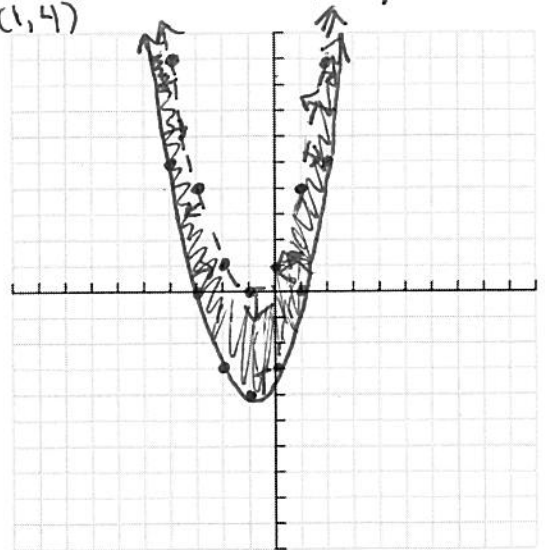
$$y = (-1)^2 + 2(-1) - 3$$

$$y = 1 - 2 - 3 = -4$$

vertex: (-1, -4)

x	y	(x,y)
-3	4	(-3,4)
-2	1	(-2,1)
-1	0	(-1,0)
0	1	(0,1)
1	4	(1,4)

x	y	(x,y)	Test:
-3	0	(-3,0)	(0,0)
-2	-3	(-2,-3)	$0 \geq 0^2 + 2(0) - 3$
-1	-4	(-1,-4)	$0 \geq -3 \checkmark$
0	-3	(0,-3)	
1	0	(1,0)	



Write a quadratic function whose graph has the given characteristics.

8. x-intercepts: -3, 2 and point: (3, 12)

$$y = a(x+3)(x-2)$$

$$12 = a(3+3)(3-2)$$

$$12 = a(6)(1)$$

$$\frac{12}{6} = \frac{6a}{6} \quad a = 2$$

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

10. passes through the points (5, 2), (0, 2), and (8, -6)

$$y = ax^2 + bx + 2$$

$$2 = a(5)^2 + b(5) + 2$$

$$2 = 25a + 5b + 2$$

$$-2 = -25a - 5b$$

$$-6 = a(8)^2 + b(8) + 2$$

$$-6 = 64a + 8b + 2$$

$$-8 = 64a + 8b$$

$$-8 = 64a + 8(-5a)$$

$$-8 = 64a - 40a$$

$$-8 = 24a$$

$$a = -\frac{1}{3}$$

$$b = -\frac{5}{3}$$

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

9. vertex: (2, 7) and point: (4, 2)

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

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

$$2 = a(2)^2 + 7$$

$$2 = 4a + 7$$

$$-5 = 4a$$

$$a = -\frac{5}{4}$$

$$y = -\frac{5}{4}(x-2)^2 + 7$$