Algebra 2/Trig1

Graphing Quadratic Equations

Name Answer Key

Block _____ Date _____

Linear Equation: equations with an exponent of one. Graphs are lines.

Standard Form $y = mx + b$

Quadratic Equations: equations with an exponent of two (squared). Graphs are parabolas.

Standard Form $y = ax^2 + bx + c$

Opening up $a > 0$ positive

Opening down (flipped) $a < 0$ negative

Write the quadratic equation in standard form and determine if the graph opens up or down.

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

UP

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

$-x^2 - x + 3$

down

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

$-3x^2 - 4x + 1$

down

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

$-3x^2 + 4$

UP

5.) $y = x + 9x^2$

$9x^2 + x$

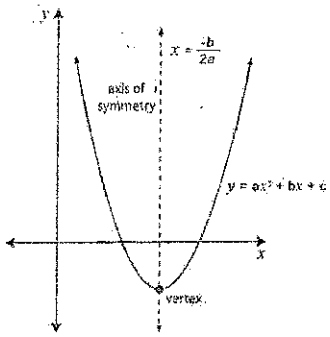
UP

6.) $y = 3x^2 + 5x^2 - 3x + 2$

$8x^2 - 3x + 2$

UP

Vertex: the lowest or the highest point of the graph



Axis of Symmetry: the vertical line through the vertex

Axis of Symmetry and x-coordinate of the vertex

$$x = -\frac{b}{2a}$$

Find the axis of symmetry of the parabola.

7.) $y = 2x^2 + 4x - 1$

$x = \frac{-4}{2(2)} = \frac{-4}{4}$

x = -1

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

$\frac{-2}{2(-1)}$

x = 1

9.) $y = 3x^2 - 5$

$\frac{0}{2(3)}$

x = 0

Find the vertex of the parabola. Find x using formula and then plug it back into equation to find y.

10.) $y = x^2 + 2x - 1$

$x = \frac{-2}{2(1)} = -1$

(-1, -2)

11.) $y = -x^2 + 4$

$\frac{0}{2(-1)} = 0$

(0, 4)

12.) $y = 2x^2 + 4x$

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

(-1, -2)

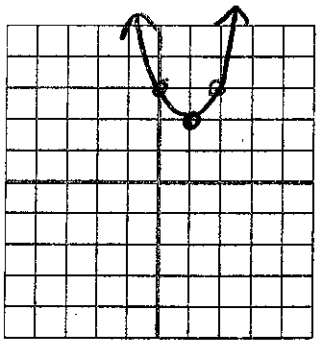
Graph the following quadratic equations. Find the axis of symmetry and the vertex.

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

x = 1

Vertex: (1, 2)

Point: (0, 3)

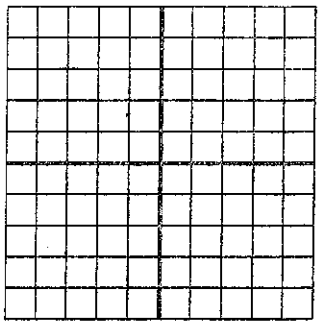


14. $y = x^2 + 5x - 6$

x = _____

Vertex: _____

Point: _____



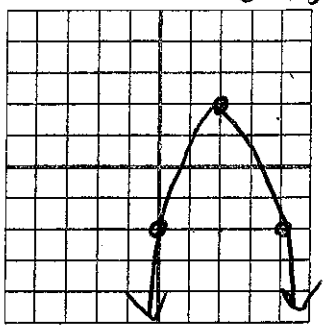
15. $y = -x^2 + 4x - 2$ $\frac{-4}{2(-1)}$

x = 2

Vertex: (2, 2)

Point: (0, -2)

$-(2)^2 + 4(2) - 2$



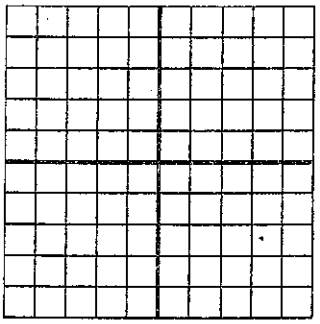
Standard Form: Practice Problems: pg 253 #20-25

20.) $y = x^2 - 2x - 1$

x = _____

Vertex: _____

Point: _____

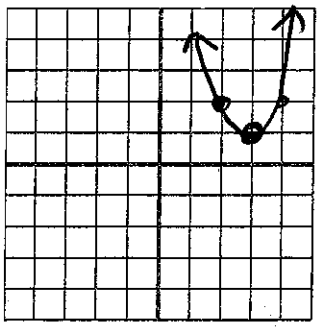


21.) $y = 2x^2 - 12x + 19$ $\frac{12}{2(2)}$

x = 3

Vertex: (3, 1)

Point: (0, 19)

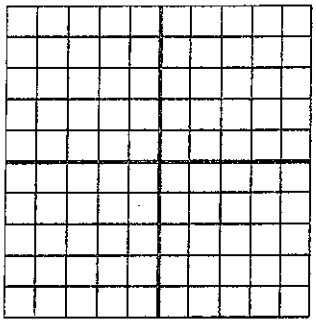


22.) $y = -x^2 + 4x - 2$

x = _____

Vertex: _____

Point: _____

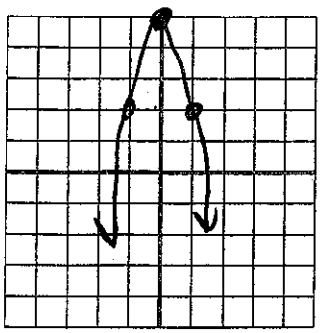


23.) $y = -3x^2 + 5$ $\frac{0}{2(-3)}$

x = 0

Vertex: (0, 5)

Point: (1, 2)

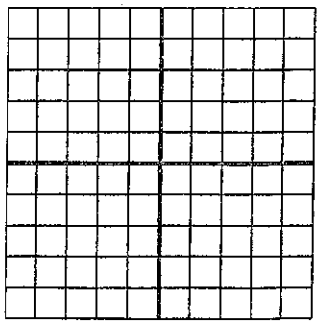


24.) $y = \frac{1}{2}x^2 + 4x + 5$

x = _____

Vertex: _____

Point: _____



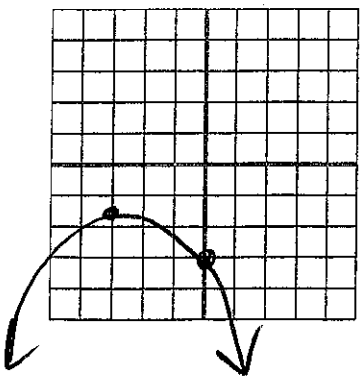
25.) $y = -\frac{1}{6}x^2 - x - 3$

x = -3

Vertex: (-3, -1.5) $\frac{1}{2(-\frac{1}{6})}$

Point: (0, -3)

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



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

Opening up $a > 0$

Opening down (flipped) $a < 0$

Determine if the graph opens up or down.

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

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

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

Axis of Symmetry and x-coordinate of the vertex
$x = h$

Intercept Form Vertex: (h,k)

Find the axis of symmetry of the parabola.

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

5.) $y = -4(x)^2 - 5$ x = 0

6.) $y = 7(x+9)^2 + 2$ x = -9

Find the vertex of the parabola (h,k).

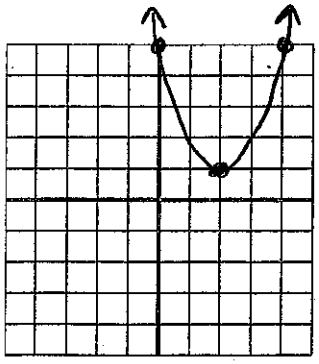
7.) $y = (x-3)^2 + 3$ (3,3)

8.) $y = \frac{1}{2}(x-6)^2$ (6,0)

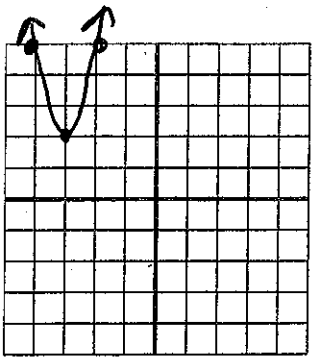
9.) $y = (x+1)^2 - 7$ (-1,-7)

Graph the following quadratic equations. Find the axis of symmetry and the vertex.

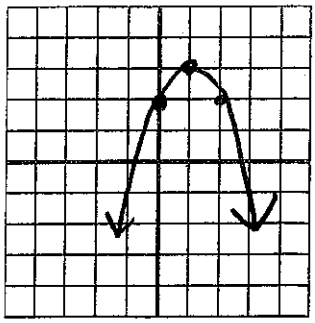
10. $y = (x-2)^2 + 1$
x = 2
Vertex: (2,1)
Point: (0,5)



11. $y = 3(x+3)^2 + 2$
x = -3
Vertex: (-3,2)
Point: (-4,5)



12. $y = -(x-1)^2 + 3$
x = 1
Vertex: (1,3)
Point: (0,2)



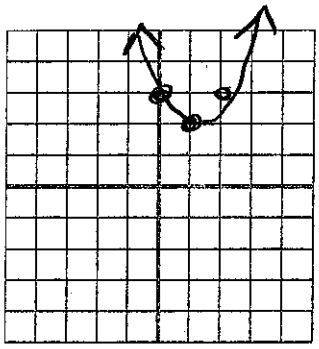
Vertex Form: Practice Problems: pg 253 #26-31

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

x = 1

Vertex: (1,2)

Point: (0,3)

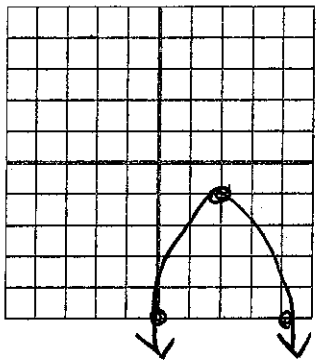


27.) $y = -(x - 2)^2 - 1$

x = 2

Vertex: (2,-1)

Point: (0,-5)

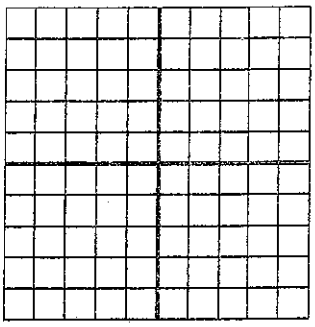


28.) $y = -2(x + 3)^2 - 4$

x = _____

Vertex: _____

Point: _____

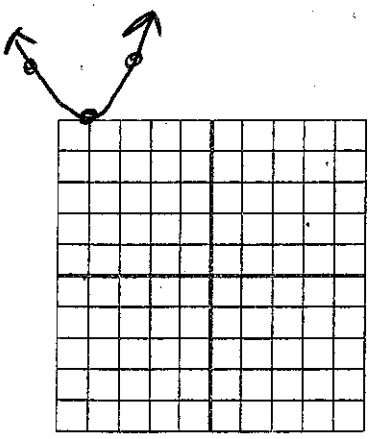


29.) $y = 3(x + 4)^2 + 5$

x = -4

Vertex: (-4,5)

Point: (-5,8)

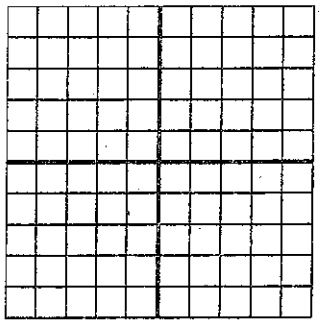


30.) $y = -\frac{1}{3}(x + 1)^2 - 1$

x = _____

Vertex: _____

Point: _____

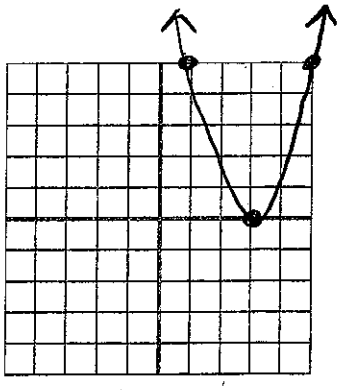


31.) $y = \frac{5}{4}(x - 3)^2$

x = 3

Vertex: (3,0)

Point: (1,5)



Intercept Form $y = a(x - p)(x - q)$ → **p and q are the x-intercepts**

Opening up a > 0

Opening down (flipped) a < 0

Determine if the graph opens up or down.

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

2.) $y = -2(x - 1)(x - 4)$ down

3.) $y = 2x(x - 3)$ up

Axis of Symmetry and x-coordinate of the vertex

x is half way between p and q

$$x = \frac{p+q}{2}$$

Find the axis of symmetry of the parabola.

4.) $y = -2(x-1)(x-5)$

$\frac{1+5}{2}$

x = 3

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

$\frac{-2+4}{2}$

x = 1

6.) $y = -x(x+5)$

$\frac{0-5}{2}$

x = $-5/2$

Find the vertex of the parabola. Find x by counting half way between p and q. Find y by plugging x into the given equation.

7.) $y = (x+5)(x-3)$

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

(-1, -16)

8.) $y = -4(x+1)(x-1)$

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

(0, 4)

9.) $y = 3(x-6)(x-4)$

$\frac{6+4}{2}$

(5, -3)

Graph the following quadratic equations. Find the axis of symmetry and the vertex.

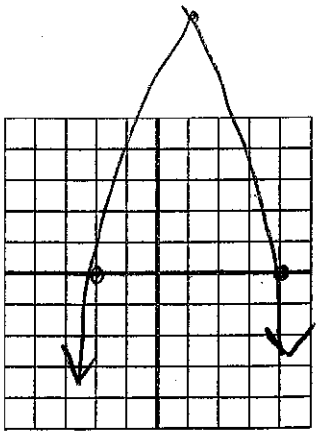
10.) $y = -2(x+2)(x-4)$

x = 1

$\frac{-2+4}{2}$

Vertex: (1, 18)

Point: (4, 0)



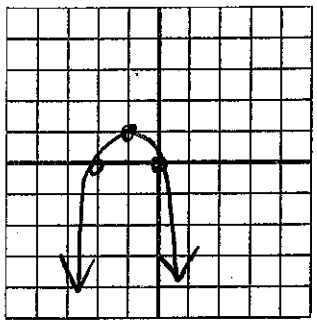
11.) $y = -x(x+2)$

$\frac{0-2}{2}$

x = -1

Vertex: (-1, 1)

Point: (0, 0)

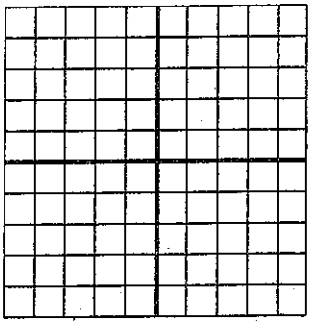


12.) $y = (x+3)(x-3)$

x = _____

Vertex: _____

Point: _____



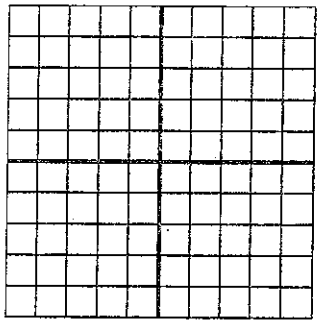
Intercept Form: Practice Problems: pg 254 #32 – 37

32.) $y = (x - 2)(x - 6)$

x = _____

Vertex: _____

Point: _____

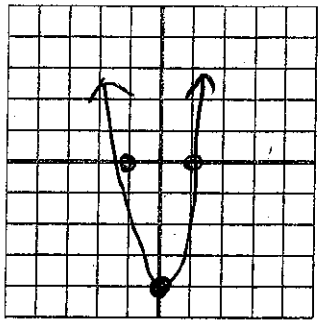


33.) $y = 4(x + 1)(x - 1)$

x = 0 $\quad \frac{-1+1}{2}$

Vertex: (0, -4)

Point: (-1, 0)

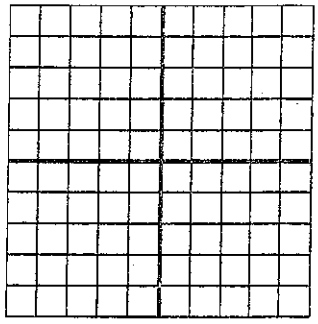


34.) $y = -(x + 3)(x + 5)$

x = _____

Vertex: _____

Point: _____

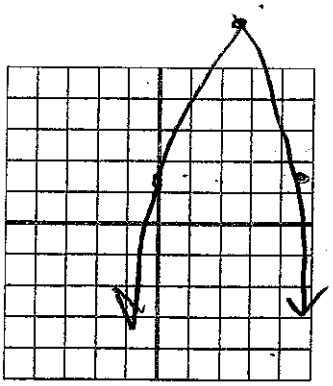


35.) $y = 1/3(x + 4)(x + 1)$

x = 5/2 $\quad \frac{-4+-1}{2}$

Vertex: (2.5, 7.5)

Point: (0, 1.3)

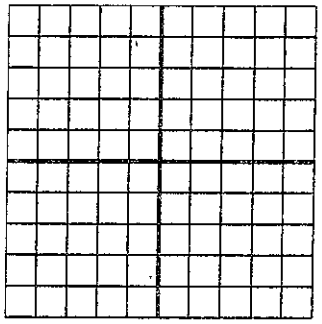


36.) $y = -\frac{1}{2}(x - 3)(x + 2)$

x = _____

Vertex: _____

Point: _____



37.) $y = -3x(x - 2)$ $\quad \frac{0+2}{2}$

x = 1

Vertex: (1, 3)

Point: (2, 0)