Sec 3.1.1 Quadratics

Today - finding the vertex, y-intercepts and orientation from vertex and standard forms

Graphing Using Vertex Form

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

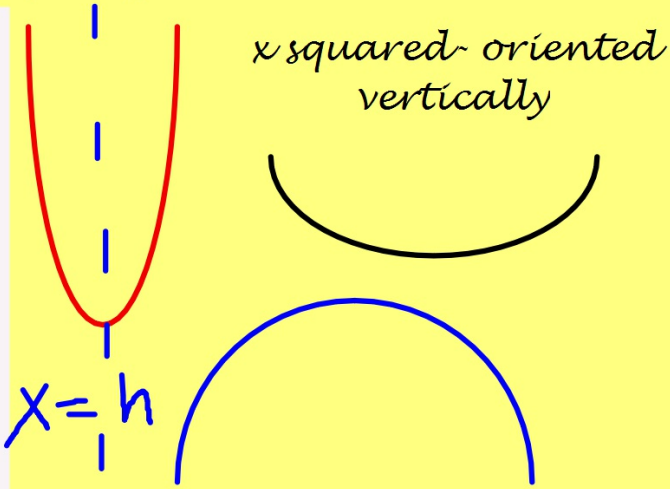
Vertex: (h, k)

Axis of symmetry: x = h

VERTICAL LINE

If a is positive, then it opens up.

If a is negative, then it opens down.



x squared- oriented vertically

*from previous material, you should know the domain, range, increasing and decreasing intervals, local max/min, if it's a function and if it has an inverse

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

vertex → (1, 4)

orientation ↑

y-intercept → Let $x = 0$

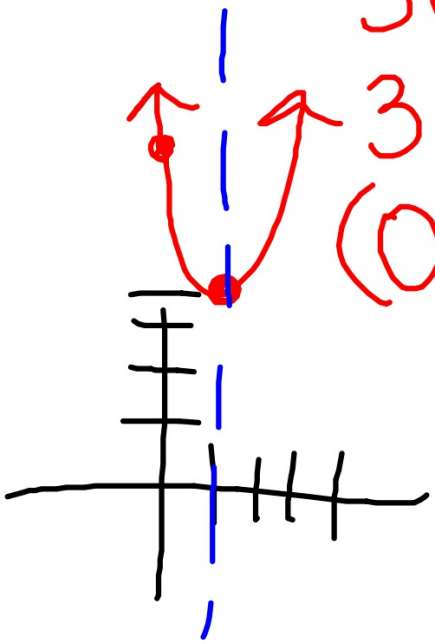
axis of symmetry-

$x = 1$

$3(-1)^2 + 4$

$3(1) + 4$

(0, 7)



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

vertex $(-3, 1)$

orientation ↑↑

y-intercept

axis of symmetry $x = -3$

$(0+3)^2+1$

$= 9+1$

$= (0, 10)$

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

vertex $(2, -4)$

b/c of $-\frac{1}{2}$

y-int

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

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

$-2 - 4$

$(0, -6)$

AOS

$x = 2$

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

vertex $(-2, 4)$

orientation

y-intercept $(0, 0)$

axis of symmetry $x = -2$

$-(2)^2 + 4$

$-4 + 4$

0

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

V $(1, 3)$

y-int

$(0-1)^2 + 3$

$1 + 3$

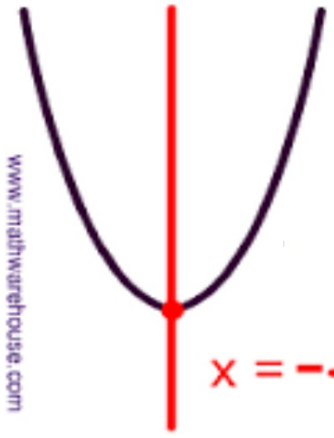
$(0, 4)$

AOS → $x = 1$

Standard Form

Use "little formula" to determine the x value of the vertex. Back substitute to determine the y value of the vertex.

$y = ax^2 + bx + c$



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

"little formula"

*consider putting some of this on your notecard

Determine the vertex, orientation, y-intercept and axis of symmetry.

6. $y = x^2 - 8x + 12$

$$x_v = \frac{8}{2(1)} = 4$$

$$y_v = 4^2 - 32 + 12$$
$$= 16 - 32 + 12$$
$$= -4$$

V (4, −4)

AOS $x = 4$

$$y = 0^2 - 8(0) + 12$$
$$= 0 - 0 + 12$$
$$= 12$$

y-int @ (0, 12)

Determine the vertex, orientation y-intercept and axis of symmetry-

7. $y = -3x^2 - 12x - 11$

y-int @ (0, -11)

AOS

$X = -2$

$x_v = \frac{12}{2(-3)} = -2$

$y_v = 3(-2)^2 - 12(-2) - 11$

$= 3(4) + 24 - 11$

$= 12 + 24 - 11$

$= 1$ $(-2, 1)$

Determine the vertex, orientation, y-intercept and axis of symmetry-

8. $y = x^2+4x+2$

↑↑

y-int (0,2)

AOS

$X = -2$

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

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

$= 4 - 8 + 2$

$= -2$

$(-2, -2)$

Determine the vertex, orientation, y-intercept and axis of symmetry-

9. $y = x^2 + 8x + 20$

↑↑

y-int @ (0, 20)

AOS

$x = -4$

$x_v = \frac{-8}{2} = -4$

$y_v = (-4)^2 + 8(-4) + 20$

$= 16 - 32 + 20$

$= -16 + 20$

$= 4$ $(-4, 4)$

Suggested Practice

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1. $h(x)=(x-1)^2+1$

2. $(x+1)^2+1$

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

4. $(x+1)^2-1$

5. $h(x)=x^2-1$

6. x^2+2x+1

7. $g(x)=x^2-2x+1$

8. $-x^2-1$

9. $(3,1)$

10. $(2,12)$

11. $(-1,5)$

12. $(-4, -8)$

13. $(2, -5)$

14. $\frac{12}{2(3)} = 2 \quad (2, -11)$

15. $(-1, 9)$

16. $\frac{-8}{2(-2)} = 2 \quad (2, 7)$