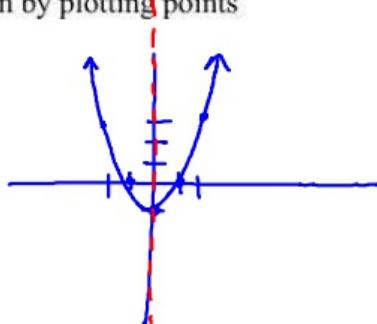


What you will learn about:
Graphing Quadratics

Graph the equation by plotting points

$$y = x^2 - 1$$

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



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

$a > 0$ parabola opens up

$a < 0$ parabola opens down

Determine whether each parabola opens up or down.

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

opens down

$$y = 6x^2 + 7x - 9$$

opens up

Vertex

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

Find y Plus

x back into equation

axis of symmetry

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

Finding the vertex and axis of symmetry of a parabola in standard form.

$$y = 3x^2 - 6x + 2$$

$$\begin{aligned} x &= \frac{-b}{2a} \\ &= \frac{-6}{2(3)} \\ &= \frac{6}{6} \\ &= 1 \end{aligned}$$

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

$$\begin{aligned} &= 3 - 6 + 2 \\ &= -3 + 2 \\ &= -1 \end{aligned}$$

$$V(1, -1)$$

AOS

$$y = 2x^2 - 8x + 1$$

$$x = \frac{8}{2(2)} \\ = 2$$

$$y = 2(2)^2 - 8(2) + 1 \\ 8 - 16 + 1$$

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

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

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

y-intercept

Let $x=0$ solve for

y

Standard form
(0, c)

x-intercept

Let $y=0$ solve

for x

(Factor) (Quadratic Form)

$$V(2, -7)$$

A.O.S $x=2$

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

$$y = x^2 - 2x - 8$$

$$y = 0^2 - 2(0) - 8 \\ 0 = x^2 - 2x - 8$$

$$\text{y-inter} \\ (0, -8)$$

$$V(1, -5)$$

A.O.S $x=1$

Find the intercepts of a parabola

x-intercept

$$b^2 - 4ac \\ (-2)^2 - 4(1)(-8) \\ 4 + 32 \\ 36$$

$$0 = x^2 - 2x - 8$$

$$(x-4)(x+2)$$

$$x-4=0 \quad x+2=0$$

$$x=4 \quad x=-2$$

$$y = x^2 - 4x - 12$$

$$\text{y-inter} \\ (0, -12)$$

x-inter

$$0 = x^2 - 4x - 12$$

$$(x-6)(x+2)$$

$$x=6 \quad x=-2$$

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

y-inter

$$(0, 4)$$



$$b^2 - 4ac < 0$$

x-inter

$$1^2 - 4(5)(4)$$

None

$$1 - 80$$

$$\boxed{-79}$$

$$y = 4x^2 - 12x + 9$$

y-inter

$$(0, 9)$$

x-inter

$$(2x-3)(2x-3)$$

$$x = \frac{3}{2} \quad x = \frac{3}{2}$$

$$y = -x^2 - 12x - 36$$

y.int

$$(0, -36)$$

x-inter

$$0 = -x^2 - 12x - 36$$

$$= x^2 + 12x + 36$$

$$(x+6)(x+6)$$

$$144 - 4(-1)(-36)$$

$$144 - 144$$

$$0$$

Opens up/down

Graph

Graph the quadratic equation

Vertex

Graph $y = x^2 - 6x + 8$

A.O.S.

opens up

A.O.S. $x = 3$

y-inter

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

$$y\text{-inter } (0, 8)$$

x-inter

$$= \frac{6}{2(1)} = 3$$

x-inter

$$y = 3 - 6(3) + 8$$

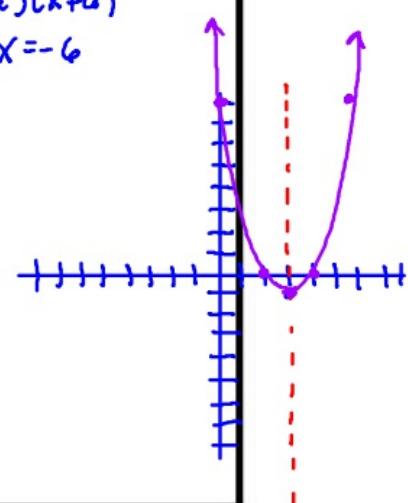
$$0 = x^2 - 6x + 8$$

$$9 - 18 + 8$$

$$(x-4)(x-2)$$

$$9 - 18 + 8$$

$$y = 4 \quad x = 2$$



Graph $y = -x^2 + 6x - 9$

open Down

$$X = \frac{-6}{2(-1)} = 3$$

$$Y = -(3)^2 + 6(3) - 9 \\ -9 + 18 - 9$$

$$V(3, 0)$$

$$A.O.S X=3$$

y -inter

$$(0, -9)$$

Graph $y = x^2 + 4x + 5$

opens up

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

$$Y = (-2)^2 + 4(-2) + 5 \\ 4 - 8 + 5$$

$$V(-2, 1)$$

$$A.O.S X=-2$$

Graph $y = 2x^2 - 4x - 3$

opens up

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

$$Y = 2(1)^2 - 4(1) - 3 \\ 2 - 4 - 3 \\ -5$$

$$V(1, -5)$$

$$A.O.S X=1$$

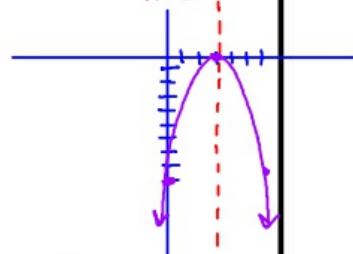
x-inter

$$0 = -x^2 + 6x - 9$$

$$x^2 - 6x + 9$$

$$(x-3)(x-3)$$

$$x=3$$



y -inter

$$(0, 5)$$

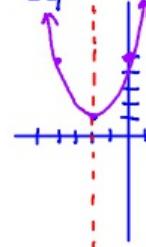
x-inter

None

$$b^2 - 4ac(c)$$

$$16 - 4(1)(5)$$

$$-4$$



y -inter

$$(0, 5)$$

x-inter

None

$$(-4)^2 - 4(1)(-3)$$

$$16 - (-12)$$

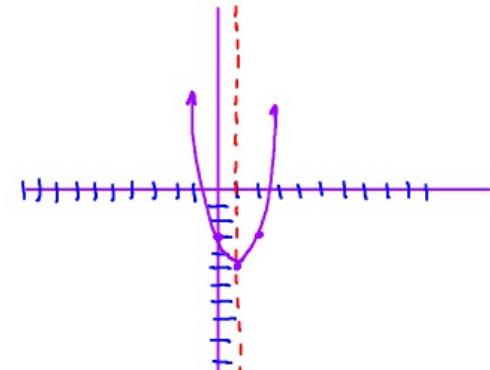
$$40$$

$$\frac{4 \pm \sqrt{40}}{4} = \frac{4 \pm 2\sqrt{10}}{4}$$

$$\frac{2 \pm \sqrt{10}}{2}$$

$$1 \pm \frac{1}{2}\sqrt{10}$$

$$1 \pm \frac{\sqrt{10}}{2}$$



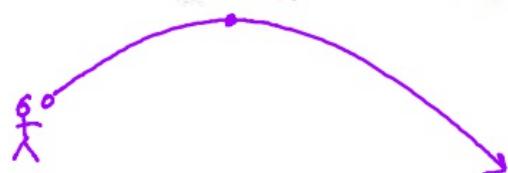
$-16 \rightarrow$ gravity

$v_0 \rightarrow$ initial Velo

$h_0 \rightarrow$ initial height

The quadratic equation $h = -16t^2 + v_0t + h_0$ models the height of a volleyball hit straight upwards with a velocity 176 feet per second from a height of 4 feet.

How many seconds will it take the volleyball to reach its maximum height? $h = -16t^2 + 176t + 4$



$$t = \frac{-b}{2a}$$
$$= \frac{-176}{2(-16)}$$

$$= 5.5 \text{ sec}$$

What is the maximum height of the volleyball.
 $h = -16(5.5)^2 + 176(5.5) + 4$
488 ft

The quadratic equation $h = -16t^2 + 128t + 32$ is used to find the height of a stone thrown upward from a height of 32 feet at a rate of 128 ft/sec. How long will it take the stone to reach its maximum height? What is the maximum height? How long will it take the stone to hit the ground?

A toy rocket shot upward from the ground at a rate of 208 ft/sec has the quadratic equation of $h = -16t^2 + 208t$. When will the rocket reach its maximum height? What will be the maximum height.

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

A.O.S
 $x = h$

Quadratics in vertex form.

Finding the vertex and axis of symmetry.

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

$$V(1, 3)$$

A.O.S $x = 1$

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

$$V(-1, -3)$$

A.O.S $x = -1$

Finding the intercepts.

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

$$y = -(x+6)^2 + 10$$

Graph the following:

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

Vertex: _____

Axis of symmetry: _____

Opens: up down

Maximum Minimum

Max/Min Value: _____

y-intercept: _____

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

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

