

FORMS OF QUADRATICS

Vertex Form

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

Vertex: (h, k)

Line of symm: $x = h$

Direction: $+a$ up
 $-a$ down

Width: $|a| > 1$ narrow (vert. stretch)
 $|a| = 1$ normal
 $0 < |a| < 1$ wide (vert. shrink)

Standard Form

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

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

$y =$ sub in x -coord,

$$y = 5(x-3)^2 + 1 \quad (3, 1)$$

$$y = 5(x-3)(x-3) + 1$$

$$y = 5(x^2 - 3x - 3x + 9) + 1$$

$$y = 5(x^2 - 6x + 9) + 1$$

$$y = 5x^2 - 30x + 45 + 1$$

$$y = \underset{a}{5}x^2 - \underset{b}{30}x + \underset{c}{46} \quad (3, 1)$$

$$x = \frac{-b}{2a} = \frac{+30}{2(5)} = 3$$

$$y = 5(3)^2 - 30(3) + 46$$

$$= 45 - 90 + 46$$

$$= 1$$

$(3, 1)$

$$y = -\frac{1}{2}x^2 + 6x - 15$$

$$x = \frac{-b}{2a} = \frac{-6}{2(-\frac{1}{2})} = 6$$

$$y = -\frac{1}{2}(6)^2 + 6(6) - 15$$

$$= -18 + 36 - 15 = 3$$

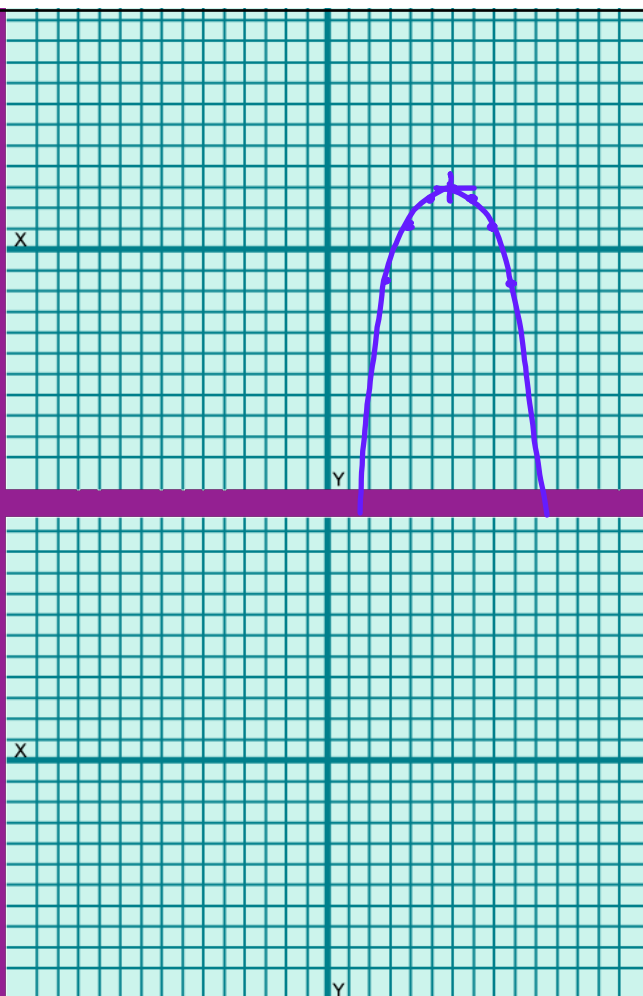
Vertex: (6, 3)

Line of symm. $x = 6$

Direction: Down

Width: Wide

$$\begin{array}{r|l} 0 & 0 \\ 1 & -12 \\ 2 & -2 \\ 3 & -4.5 \end{array}$$



$$y < 3x^2 - 12x + 11$$

$$x = \frac{-b}{2a} = \frac{12}{2(3)} = 2$$

$$y = 3(2)^2 - 12(2) + 11 = 12 - 24 + 11 = -1$$

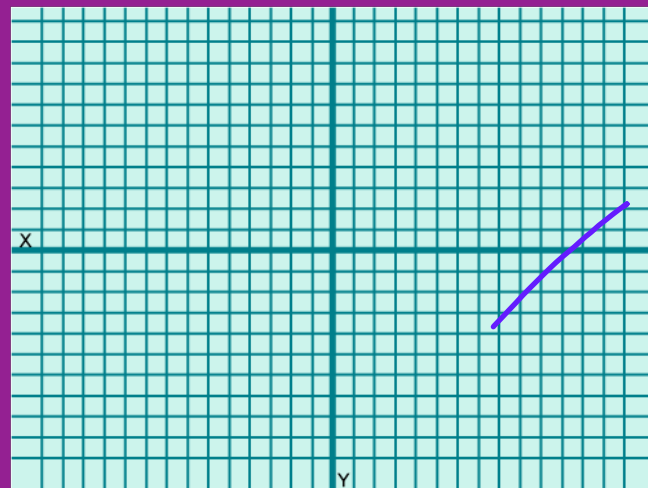
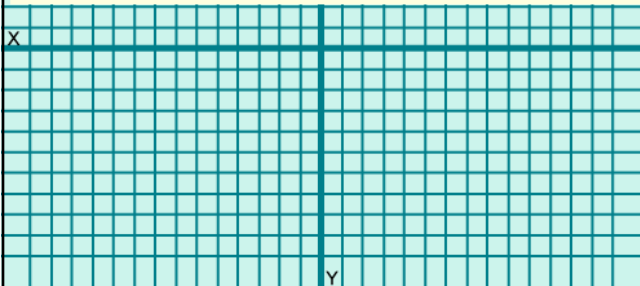
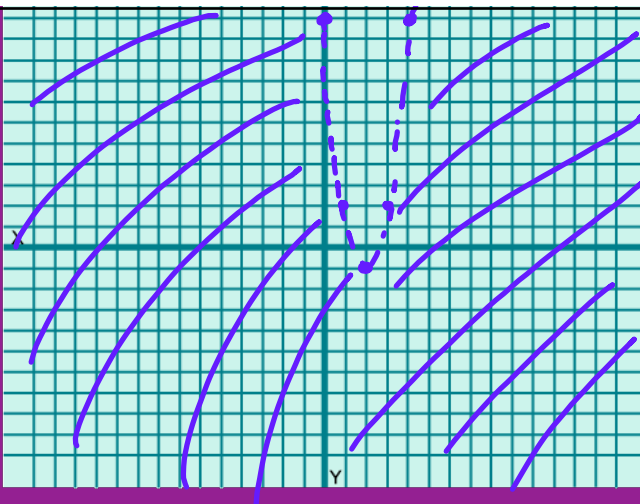
Vertex: (2, -1)

Line of symm: $x = 2$

Direction: Up

Width: Narrow

$$\begin{array}{c|c} 0 & 0 \\ 1 & x \\ 2 & 3 \\ 3 & 12 \end{array}$$



$$y \leq -2(x+1)(x-3)$$

1) Find x-intercepts:

$$\begin{aligned} x+1=0 & \quad x-3=0 \\ x=-1 & \quad x=3 \end{aligned}$$

2) Find vertex

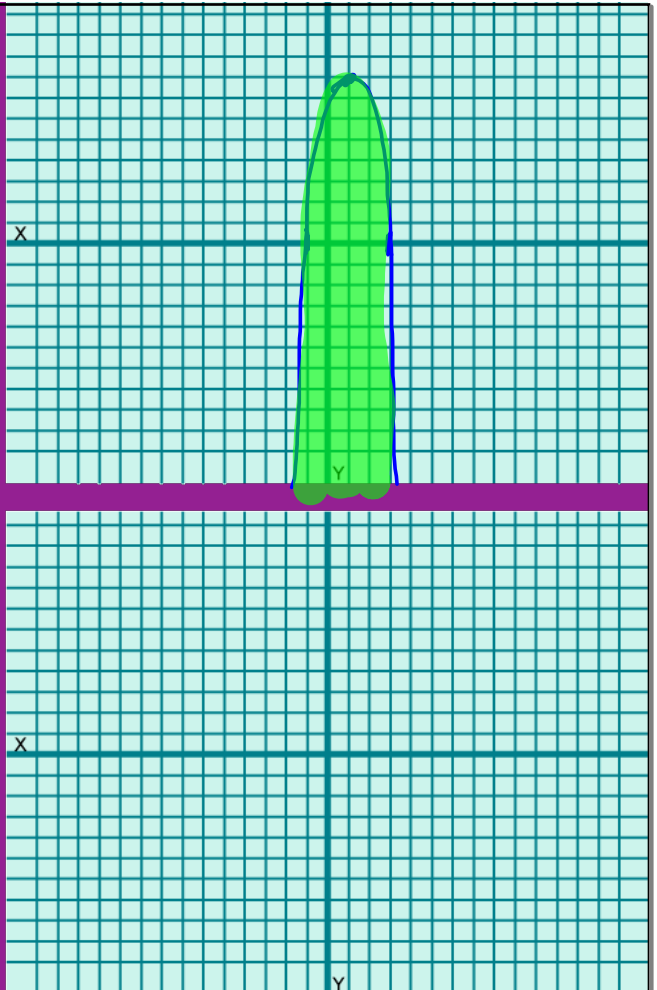
$$\begin{aligned} x\text{-coord} &= \frac{-1+3}{2} = \frac{2}{2} = 1 \\ y\text{-coord} &= -2(1+1)(1-3) \\ &= -2 \cdot 2 \cdot -2 \\ &= 8 \end{aligned}$$

Vertex: (1, 8)

Line of symm: $x=1$

Direction: Down

Width: narrow



Intercept Form ← Gives x-intercepts

$$y = a(x-p)(x-q)$$

$$x-p=0 \quad x-q=0$$

$$x=p \quad x=q$$

x-intercepts

Vertex:

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

y = sub in x-coord,

1972 Mercury Comet \$3000

$$V(t) = 18.75t^2 - 450t + 3200$$

$t = \#$ of
years after
1972

1) Find vertex

$$t = \frac{-b}{2a} = \frac{450}{2(18.75)} = \frac{450}{37.5} = 12 \text{ yrs}$$

$$1972 + 12 = 1984$$

$$V(12) = 18.75(12)^2 - 450(12) + 3200 = \$500$$



Find max or
min. =
Find vertex.

mm, 2) How much is it worth today? $\begin{array}{r} 2021 \\ - 1972 \\ \hline 49 \end{array}$

$$V(49) = 18.75(49)^2 - 450(49) + 3200$$