# FORMS OF QUADRATICS

| Vertex Form | Standard Form | Intercept Form |
|---|---|---|
| $y = \underline{a}(x-h)^2 + K$ | $y = \underline{a}x^2 + bx + c$ | $y = \underline{a}(x-p)(x-q)$ |

**Vertex Form**

$y = \underline{a}(x-h)^2 + K$

Vertex: $(h, K)$

Line of Symm.: $x = h$

Direction: $+a$ UP, $-a$ down

Width:

Narrow: $|a| > 1$

normal: $|a| = 1$

Wide: $0 < |a| < 1$

**Standard Form**

$y = \underline{a}x^2 + bx + c$

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

$y = $ sub in $x$-coord.

**Intercept Form**

$y = \underline{a}(x-p)(x-q)$

Vertex:

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

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

2) $x$-coord $= \dfrac{p+q}{2}$

3) $y = $ sub in $x$-coord.

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

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

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

$$y = 5\left(x^2 \underbrace{-3x - 3x}_{-6x} + 9\right) + 1$$

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

$$y = \overset{a}{5}x^2 \overset{b}{-30}x + \overset{c}{46}$$

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

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

$$y = 45 - 90 + 46$$

$$= 1$$

Vertex:

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

$$y = \text{sub in } x\text{-coord.}$$

$$y \geq -\frac{1}{2}\overset{a}{x^2} + \overset{b}{6x} - \overset{c}{15}$$

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

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

$$y = -\frac{1}{2}\underset{36}{(6)^2} + 6(6) - 15$$
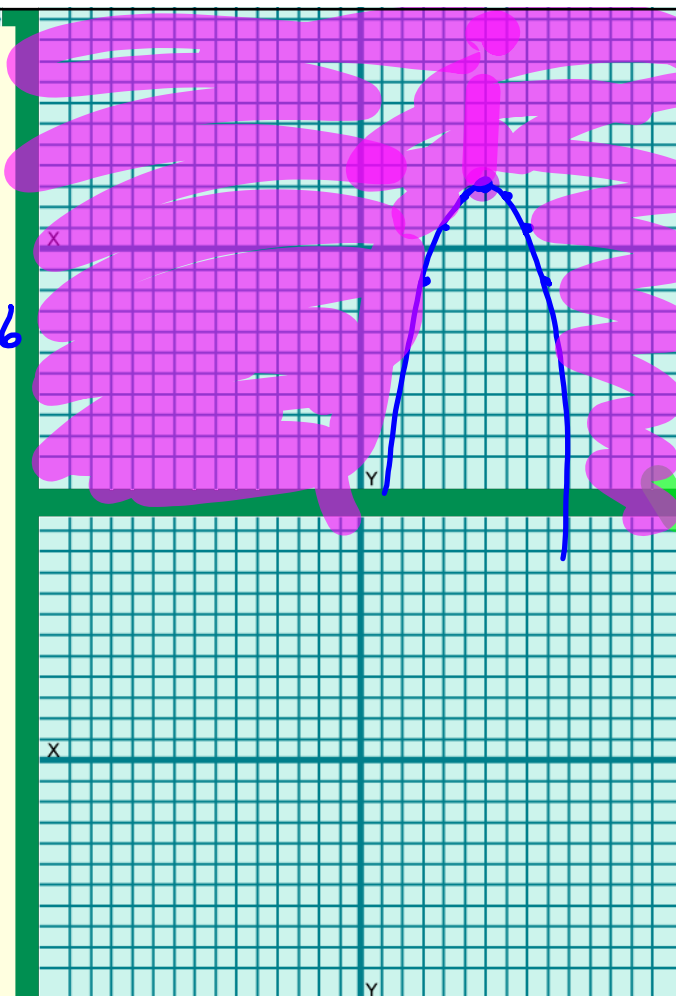
$$= -18 + 36 - 15$$
$$= 3$$

$(6,3)$

down

$x = 6$

Wide

| | |
|---|---|
| 0 | 0 |
| 1 | 1 −½ |
| 2 | 4 −2 |
| 3 | 9 −4.5 |

## Intercept Form

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

$$y = 2(x-3)(x+7)$$

$x - 3 = 0 \quad x + 7 = 0$

$x = 3 \quad x = -7$

Vertex: $x = \dfrac{3 + -7}{2} = -2$

$y = 2(-2-3)(-2+7)$

$\phantom{y} = 2(-5)(5)$

$\phantom{y} = -50$

$(-2, -50)$

$(-7, 0)$ $(3, 0)$

$(-2, -50)$ $\cdot -50$

X

Y
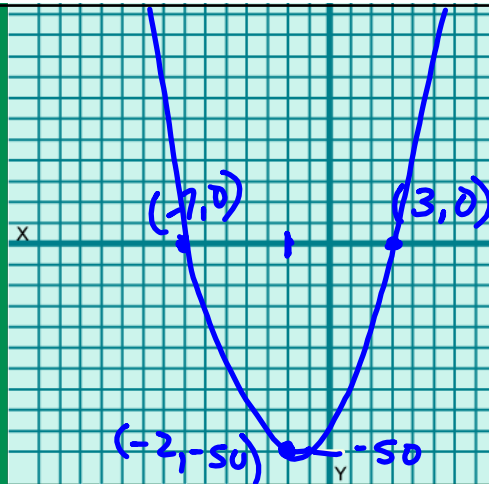
$$y = 2(x+2)^2 - 50$$

$y > 3(x+2)(x+4)$

1) $x+2=0$   $x+4=0$
   <span style="color:purple">x-int.</span> $x=-2$   $x=-4$

2) $x\text{-coord} = \dfrac{-2+-4}{2}$
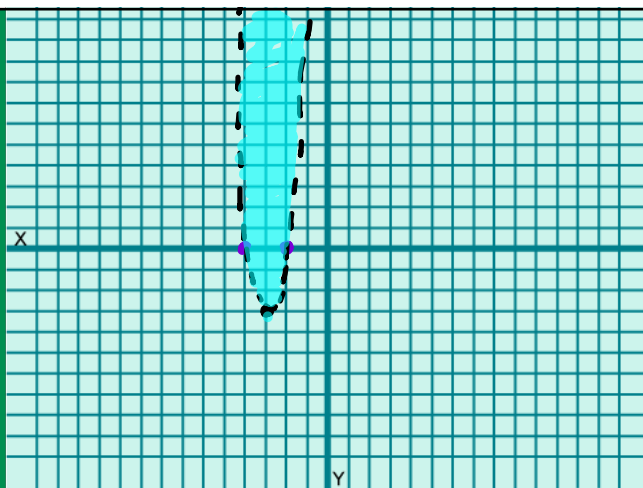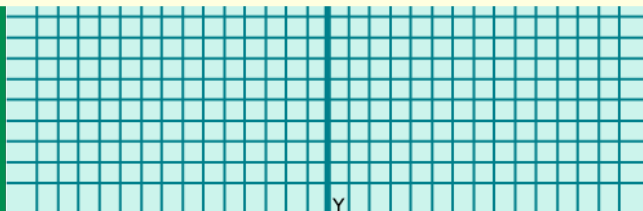
   $= -3$

3) $y = 3(-3+2)(-3+4)$
   $= 3(-1)(1)$
   $= -3$
   vertex: $(-3,-3)$

$a \doteq 3$
UP
narrow

Line of
symm.
$X = -3$

1972, Mercury Comet = $3200

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

When did it reach its <u>lowest</u> value?

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

$$\begin{array}{r} 1972 \\ +12 \\ \hline 1984 \end{array}$$

What was its lowest value?

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

$$= \$500$$

Hint:

$$y = \frac{1}{3} x (x-6)$$

$$\frac{1}{3}(x-0)(x-6)$$

$$x = 0 \quad x = 6$$

Vertex: $x = \frac{0+6}{2} = 3$