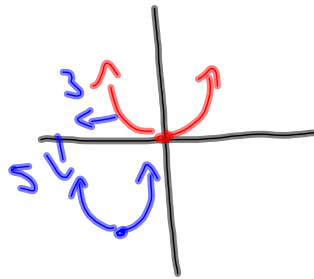


Quadratic

ax^2+bx+c $-ax^2+bx+c$
 vertex vertex
 minimum maximum
 axis of symmetry (AOS)

Vertex to graph:

$y = (x+3)^2 - 5$
 left + 3 down 5



Standard form ax^2+bx+c vertex $\left(\frac{-b}{2a}, y\right)$

$5x^2 + 15x - 7$

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

$a = 5$

$b = 15$

$\frac{-(-15)}{2(5)} = \frac{-15}{10} = \frac{-3}{2}$

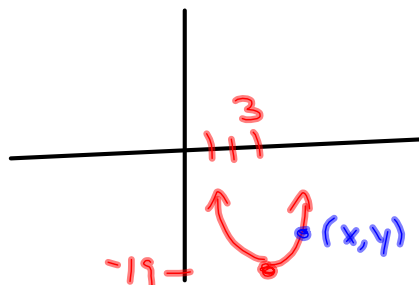
$y = 2x^2 - 12x - 1$ vertex $(3, -19)$
 $\frac{-b}{2a} = \frac{-(-12)}{2(2)} = \frac{12}{4} = 3$ $x = 3$ $y = ?$

$2(3)^2 - 12(3) - 1$

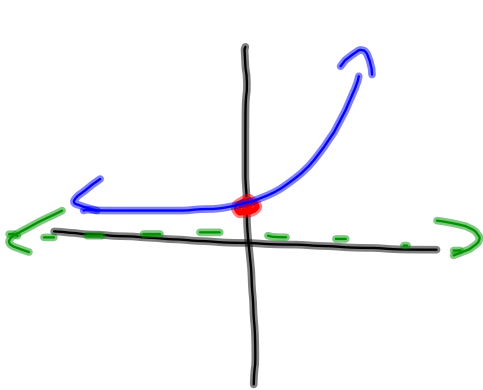
$2(9) - 36 - 1$

$18 - 36 - 1$

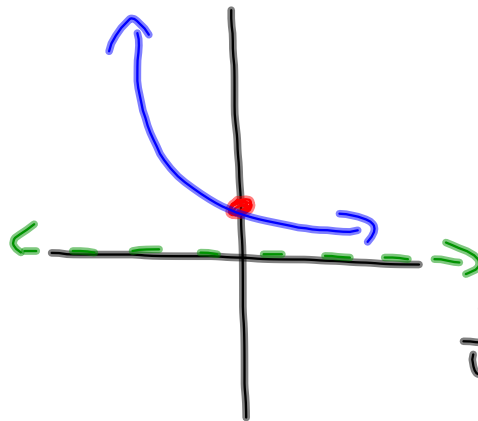
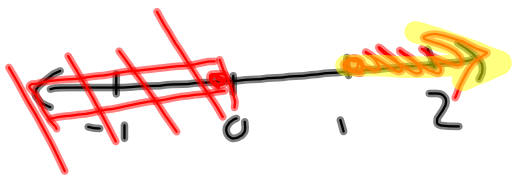
-19



Growth vs. Decay



$$y = \text{BASE}^x$$



$$y = \text{BASE}^x$$

$\frac{1}{4}, \frac{2}{4}, \frac{3}{4}$
 $\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$



Quadratic Functions "parabola"

To graph:



⊙ vertex

• $y = (x - 3)^2 + 5$
 (3, 5)

$ax^2 + bx + c$

$(x - h)^2 + k$

vertex
minimum

$-ax^2 + bx + c$

$-(x - h)^2 + k$

vertex (h, k)
maximum

Axis of Symmetry (AOS)

⊙ vertex

• $y = 3x^2 + 24x - 5$

Short cut: $(\frac{-b}{2a}, y)$

$a = 3$

$b = 24$

$\frac{-(-24)}{2(3)} = \frac{-24}{6} = -4$

$x = -4$ $y = ?$
 (-4, -53)

$y = 3(-4)^2 + 24(-4) - 5$
 $y = 3(16) - 96 - 5$
 $= 48 - 96 - 5$
 $= -53$

• $y = -2x^2 - 32x + 1$

$-\frac{b}{2a}$ (-8, 129) vertex

$a = -2$

$b = -32$

$\frac{-(-32)}{2(-2)} = \frac{32}{-4} = -8$

$-2(-8)^2 - 32(-8) + 1$
 $-2(64) + 256 + 1$
 $= 129$

Graphing Quadratic Functions:

parabola \Rightarrow Shape



Forms:

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

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

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

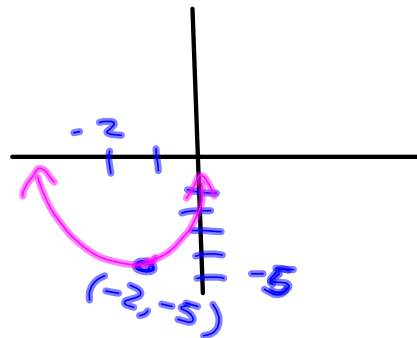
$y = -(x-h)^2 + k$

vertex vertex
 Minimum Maximum

Axis of Symmetry (AoS)

Examples:

① $y = (x + 2)^2 - 5$
 vertex $(-2, -5)$



② $y = 3x^2 + 24x - 5$

* $(\frac{-b}{2a}, y)$

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

$(-4, y)$

$a = 3$
 $b = 24$
 $\frac{-b}{2a} = \frac{-(24)}{2(3)}$

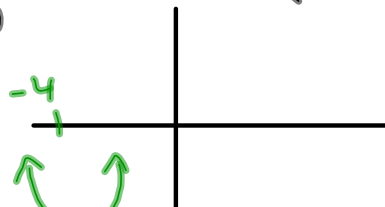
$x = \frac{-24}{6} = -4$

$y = 3(-4)^2 + 24(-4) - 5$

$= 3(16) - 96 - 5$

$= -53$

vertex
 $(-4, -53)$



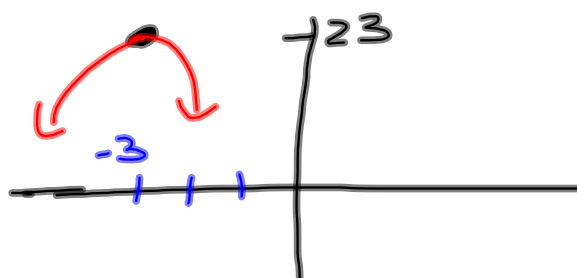
$$y = \overset{a=-2}{-2}x^2 - \overset{b=-12}{12}x + 5$$

$$\text{vertex } \left(\frac{-b}{2a}, y \right)$$

$$\frac{-b}{2a} = \frac{-(-12)}{2(-2)} = \frac{12}{-4} = -3$$

$$(-3, y) \Rightarrow (-3, 23)$$

$$\begin{aligned} y &= -2(-3)^2 - 12(-3) + 5 \\ &= -2(9) + 36 + 5 \\ &= -18 + 36 + 5 \\ &= 23 \end{aligned}$$



$$\log_e = \ln$$

$$e = \underline{2.71}$$

$$\log_{2.71} = \ln$$

Graph :

$$y = \ln(x+5)$$
$$y = \log_e(x+5)$$
$$= \log_{2.71}(x+5)$$

