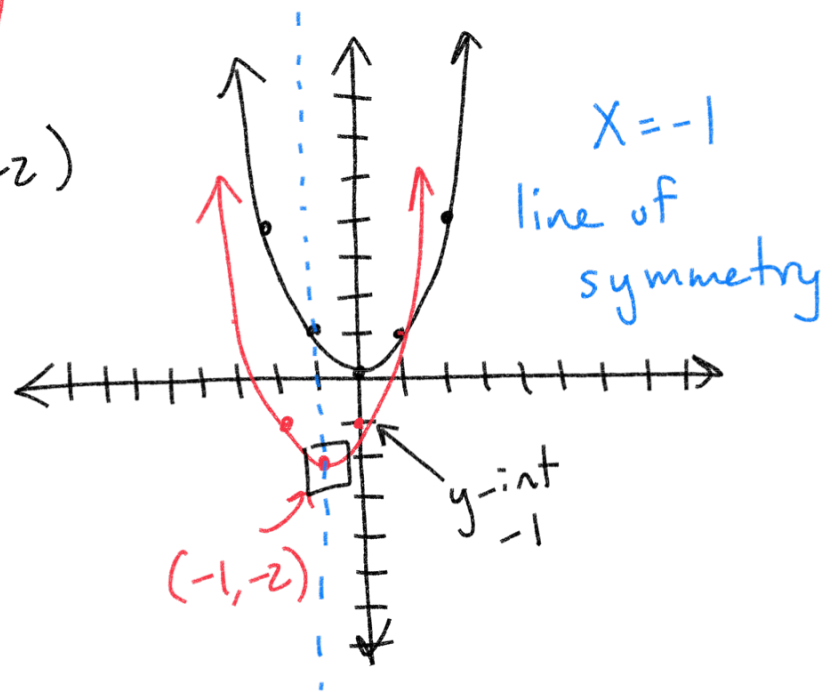


$$f(x) = (x+1)^2 - 2$$

shape: parabola

$(-1, -2)$

vertex  $(-1, -2)$



vertex form

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

$(h, k)$  vertex

Y-intercept

$$f(x) = (x+1)^2 - 2$$

$$f(0) = (0+1)^2 - 2 = 1^2 - 2 = 1 - 2 = -1$$

X-intercept (Roots)

$$x = -1 \pm \sqrt{2}$$

$$f(x) = (x+1)^2 - 2$$

$$0 = (x+1)^2 - 2$$

$$+2 \qquad +2$$

$$\sqrt{2} = \sqrt{(x+1)^2}$$

$$\pm\sqrt{2} = x+1$$

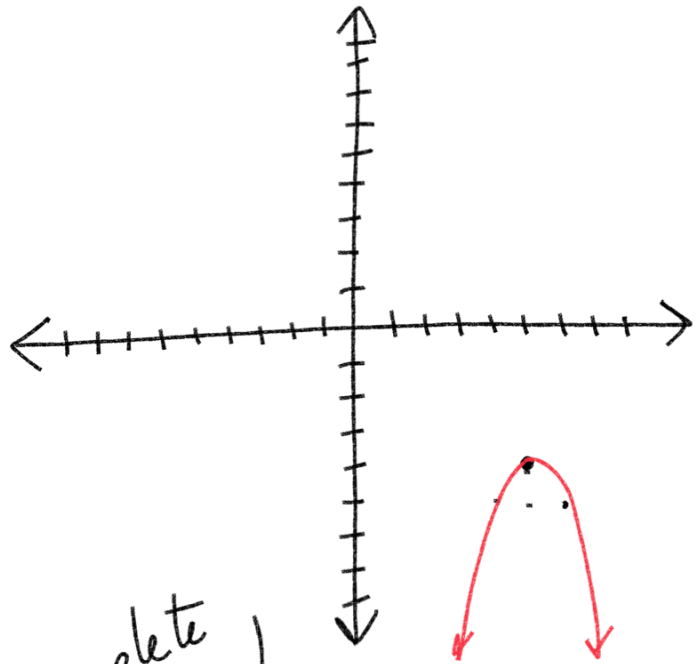
$$-1 \qquad -1$$

$$f(x) = -(x-5)^2 - 4$$

vertex: (5, -4)

flip parabola

"slope" -1



$$f(x) = x^2 + 6x - 3$$

Write in vertex form.

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

complete square!

$$\left(\frac{b}{2}\right)^2 = \left(\frac{6}{2}\right)^2 = 9$$

$$f(x) = (x^2 + 6x) - 3$$

$\uparrow$                      $\uparrow$   
 +9                    -9

vertex: (-3, -12)

$$(x^2 + 6x + 9) - 3 - 9$$

$$(x^2 + 6x + 9) - 12$$

$$\sqrt{x^2} \quad \downarrow \quad \downarrow \quad \sqrt{9}$$

$$\boxed{(x+3)^2 - 12}$$

$$f(x) = x^2 + 6x - 3$$

$$f(h) = k$$

$$f(-3) = (-3)^2 + 6(-3) - 3$$

$$\boxed{9 + (-18)} - 3$$

$$-9 - 3 = \boxed{-12}$$

Find "h"

$$-\frac{b}{2a} \quad -\frac{6}{2(1)} = -\frac{6}{2} = \boxed{-3}$$

$$\boxed{(-3, -12)}$$

$$f(x) = x^2 + 8x + 2$$

Find vertex.

$$(x^2 + 8x) + 2$$

↑                    ↑  
+16                    -16

$$\left(\frac{8}{2}\right)^2 = (4)^2 = 16$$

$$\frac{-b}{2a} = \frac{-8}{2(1)} = \frac{-8}{2} = -4$$

$$(x^2 + 8x + 16) - 14$$

√x<sup>2</sup>                    √16

$$(x + 4)^2 - 14$$

$$f(-4) = (-4)^2 + 8(-4) + 2$$

$$= 16 - 32 + 2$$

$$-16 + 2 = -14$$

vertex: (-4, -14)

(-4, -14)

$$f(x) = 3x^2 - 9x + 11$$

Find vertex

$$\frac{-b}{2a} = \frac{-(-9)}{2(3)} = \frac{9}{6} = \frac{3}{2}$$

$$h = \frac{3}{2}$$

$\left(\frac{3}{2}, \frac{17}{4}\right)$

$$3\left(\frac{3}{2}\right)^2 - 9\left(\frac{3}{2}\right) + 11$$

$$3\left(\frac{9}{4}\right) - 9\left(\frac{3}{2}\right) + 11$$

$$\frac{27}{4} - \frac{27 \cdot 2}{2 \cdot 2} + \frac{11 \cdot 4}{1 \cdot 4}$$

$\frac{27}{4} - \frac{54}{4} + \frac{44}{4}$

$$-\frac{27}{4} + \frac{44}{4} = \frac{17}{4} = k$$

$$f(x) = \frac{1}{2}x^2 - 7x + 5$$

Find the vertex

$$\frac{-b}{2a} = \frac{-(-7)}{2(\frac{1}{2})} = \frac{7}{1} = 7 = h$$

$$f(7) = \frac{1}{2}(7)^2 - 7(7) + 5$$

$$\frac{1}{2}(49) - 49 + 5$$

$$\frac{49}{2} - 49 + 5$$

$$\frac{49}{2} - \frac{98}{2} + \frac{10}{2} = -\frac{39}{2}$$

$$\boxed{\left(7, -\frac{39}{2}\right)}$$

$$-\frac{1}{7}x^2 - \frac{2}{3}x + \frac{1}{9} = f(x)$$

Find the vertex.

$$h = \frac{-b}{2a} = \frac{-(-\frac{2}{3})}{2(-\frac{1}{7})} = \frac{\frac{2}{3}}{-\frac{2}{7}}$$

$$\frac{2}{3} \div \frac{-2}{7}$$

$$\downarrow \downarrow \downarrow$$

$$\frac{2}{3} * \frac{-7}{2} = -\frac{7}{3} = h$$

$$f\left(-\frac{7}{3}\right) = -\frac{1}{7}\left(-\frac{7}{3}\right)^2 - \frac{2}{3}\left(-\frac{7}{3}\right) + \frac{1}{9}$$

$$-\frac{1}{7}\left(\frac{49}{9}\right) + \frac{14}{9} + \frac{1}{9}$$

$$\frac{-\frac{7}{9} + \frac{14}{9}}{\frac{7}{9}} + \frac{1}{9} = \frac{8}{9}$$

$$\boxed{\left(-\frac{7}{3}, \frac{8}{9}\right)}$$

