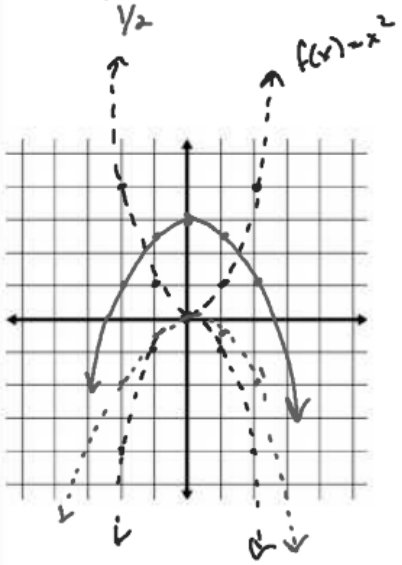
Describe how to transform the graph of $f(x) = x^2$ into the graph of the given function. Sketch each graph by hand.

a) $g(x) = -\frac{1}{2}x^2 + 3$ → up 3

Reflection over x-axis

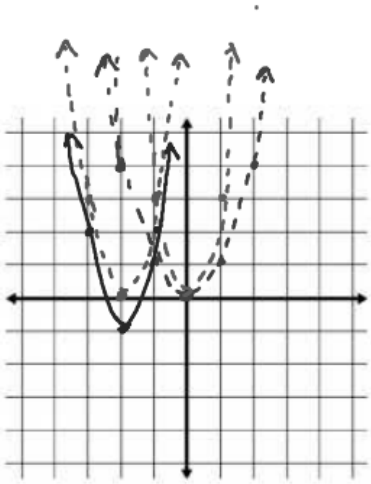
Vertical compression 1/2



b) $h(x) = 3(x+2)^2 - 1$ → Down 1

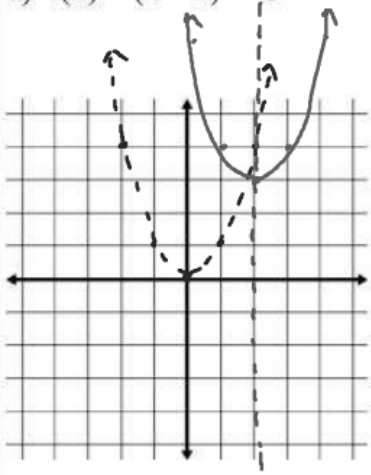
V.S by 3

Left 2



Find the vertex and axis of symmetry of the graph of the function

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

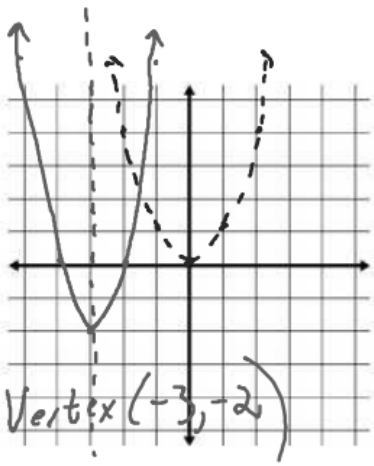


V (2, 3)

A.O.S

X = 2

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



Vertex (-3, -2)

A.O.S. X = -3

Quadratic Function

Standard Form

$y = ax^2 + bx + c$

y-intercept $(0, c)$

Vertex Form

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

Vertex (h, k)

Intercept form (Factored)

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

x-intercepts $(p, 0)$ $(q, 0)$

Find the vertex and axis of symmetry of the graph of the function. Then rewrite the equation in vertex form.

$a=3$ $b=-6$ $c=5$

a) $f(x) = 3x^2 - 6x + 5$ (h, k)

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

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

$f(1) = 3(1)^2 - 6(1) + 5$

$3 - 6 + 5$

$-3 + 5$

2

Vertex $(1, 2)$

A.O.S. $x = 1$

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

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

$a=-2$ $b=-7$ $c=-4$

32) $y = -2x^2 - 7x - 4$

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

$= \frac{7}{2(-2)} = \frac{-7}{4}$

$-2\left(\frac{-7}{4}\right)^2 - 7\left(\frac{-7}{4}\right) - 4$

$-2\left(\frac{49}{16}\right) - 7\left(\frac{-7}{4}\right) - 4$

$-\frac{49}{8} + \frac{49}{4} - 4$

$-\frac{49}{8} + \frac{98}{8} - \frac{32}{8}$

$\frac{17}{8}$

Vertex $\left(\frac{-7}{4}, \frac{17}{8}\right)$

A.O.S $x = \frac{-7}{4}$

$y = -2\left(x + \frac{7}{4}\right)^2 + \frac{17}{8}$

Describe each function:
- Opens up/down
- Vertex
- Axis of symmetry
- x-intercepts

$a>0$ opens up

$a<0$ opens Down

Find the vertex and axis of symmetry of the graph of the function without completing the square. Then rewrite the equation in vertex form. Also find the x-intercepts without using the quadratic formula.

a) $f(x) = 3x^2 - 6x + 5$ $a=3$ $b=-6$ $c=5$

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

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

$f(1) = 3(1)^2 - 6(1) + 5$

$= 3 - 6 + 5$

$= 2$

opens up.

Vertex $(1, 2)$

A.O.S. $x = 1$

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

x-intercept: None

x-intercepts

$0 = 3(x-1)^2 + 2$

$-\frac{2}{3} = \frac{3(x-1)^2}{3}$

$\sqrt{-\frac{2}{3}} = \sqrt{(x-1)^2}$

$= x - 1$

32) $y = -2x^2 - 7x - 4$

$0 = -2\left(x + \frac{7}{4}\right)^2 + \frac{17}{8}$

$-\frac{17}{8}$ $-\frac{17}{8}$

$\frac{-\frac{17}{8}}{-2} = \frac{-2\left(x+\frac{7}{4}\right)^2}{-2}$

$\sqrt{\frac{17}{16}} = \sqrt{\left(x+\frac{7}{4}\right)^2}$

$\pm\frac{\sqrt{17}}{4} = x + \frac{7}{4}$

open down

Vertex $\left(-\frac{7}{4}, \frac{17}{8}\right)$

A.O.S. $x = -\frac{7}{4}$

$y = -2\left(x + \frac{7}{4}\right)^2 + \frac{17}{8}$

$x = -\frac{7}{4} \pm \frac{\sqrt{17}}{4}$

$\frac{-\frac{17}{8}}{-\frac{2}{1}} \cdot -\frac{1}{2}$