

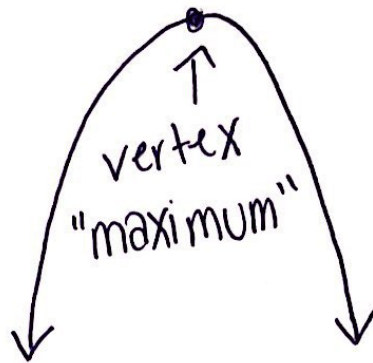
1.7: Vertex of a Parabola

- parabola - graph of a quadratic function.

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



"a" value is positive



"a" value is negative

• Ex 1) Find the vertex of $y = x^2 + 4x + 8$ $a=1$ $b=4$ $c=8$

Step 1: identify a, b, c

Step 2: find x using the formula

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

$$x = \frac{-4}{2(1)}$$

$$x = -2$$

Step 3: find y by substituting x into original equation

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

Step 4: write as a point!

$$\boxed{(-2, 4)}$$

min

• Ex 2: Find the vertex of $y = -2x^2 - 4x + 1$

$$a = -2 \quad b = -4 \quad c = 1$$

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

$$x = \frac{-(-4)}{2(-2)} = \frac{4}{-4} = -1$$

$$y = -2(-1)^2 - 4(-1) + 1$$

$$y = 3$$

$$\boxed{(-1, 3)}$$

max

• Ex 3) Find the vertex of $y = -x^2 + 5x - 2$

$$a = -1 \quad b = 5 \quad c = -2$$

$$x = \frac{-b}{2a} = \frac{-5}{2(-1)} = \frac{5}{2}$$

$$y = -\left(\frac{5}{2}\right)^2 + 5\left(\frac{5}{2}\right) - 2 = \frac{17}{4}$$

$$\boxed{\left(\frac{5}{2}, \frac{17}{4}\right)}$$

max