objective: To graph quadratic functions in standard form: $y = ax^2 + bx + c$

- **Quadratic Function**: Is a function of degree 2. function is squared.
- **Parabola**: Is the U-shaped graph that every quadratic function forms.
- **vertex**: Is the highest or lowest point on a parabola.
  * when $a > 0$ the vertex is the lowest point called the minimum. ∪
  when $a < 0$ the vertex is the highest point called the maximum. ∩
- **Axis of symmetry**: The invisible line that cuts parabola in half symmetrically. (x-coordinate of vertex)

steps:

1.) Take note of the sign for 'a' to see if parabola opens up or down.

2.) Find the axis of symmetry: $x = \frac{-b}{2a}$

3.) Plug that value $\left(\frac{-b}{2a}\right)$ back into your function to find y. This completes the vertex.

4.) To graph two helper points, from the vertex plots points using $\frac{a}{1} = \frac{\text{rise}}{\text{run}}$.

5.) Find y-intercept by plugging in zero for x to find y.

Example 1: $f(x) = 4x^2 - 8x + 1$ $\quad x = \frac{-b}{2a}$

1.) opens up $(a > 0)$

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

$\boxed{x = 1}$

axis of symmetry

3.) $y = 4(1)^2 - 8(1) + 1$

$= 4 - 8 + 1$

$= -4 + 1$

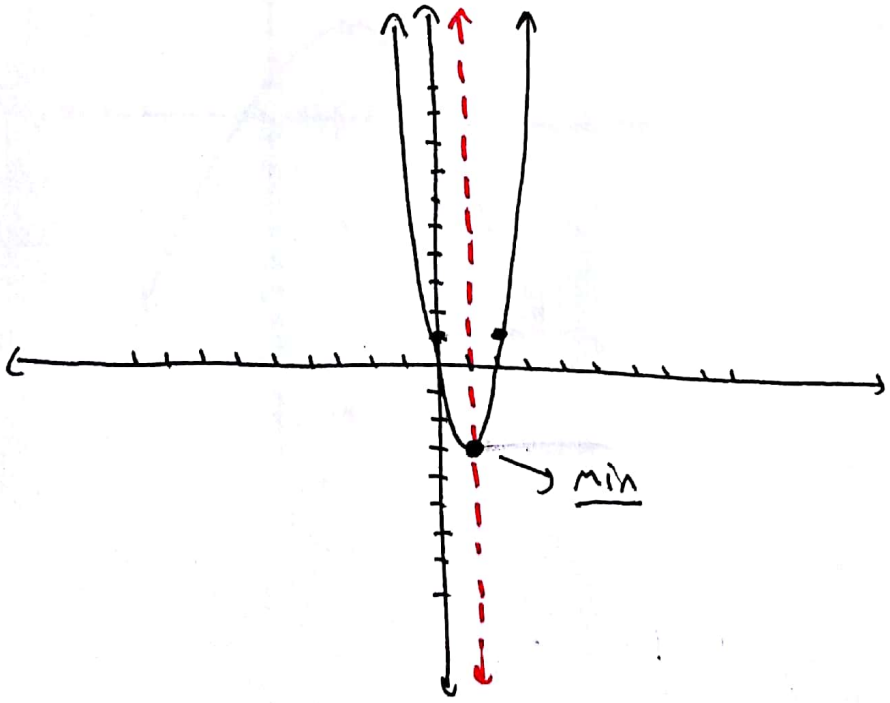
$= -3$

$\boxed{\text{vertex: } (1, -3)}$

4.) To find helper points from vertex using $\frac{a}{1}$.

5.) To find y-intercept: $y = 4(0)^2 - 8(0) + 1$

$(0, 1)$



Example 2: $f(x) = -\frac{1}{2}x^2 + 2x + 1$

1.) opens down

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

3.) $y = -\frac{1}{2}(2)^2 + 2(2) + 1$

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

$= -2 + 4 + 1$

$= 2 + 1 = 3$

$\boxed{\text{vertex: } (2, 3)}$

4.) helper points using: $\frac{-1/2}{1}$

5.) y-int: $(0, 1)$