(2) $y = -x^2 - 4x - 4$

$a = -1$

$b = -4$

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

$-4 + 8 - 4 = 0$

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

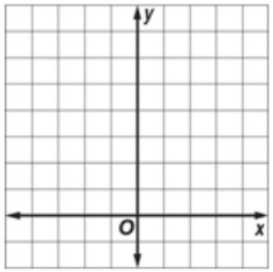
$x = -2$ axis! $(-2, 0)$

Consider each equation. Determine whether the function has *maximum* or *minimum* value. State the maximum or minimum value and the domain and range of the function. Find the equation of the axis of symmetry. Graph the function.

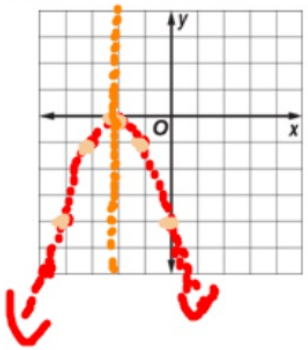
D: R

R: $y \leq 0$

1. $y = x^2 + 3$

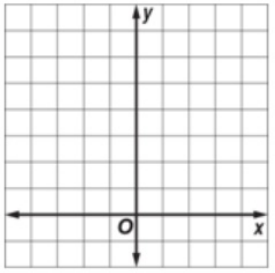


2. $y = -x^2 - 4x - 4$



y-value of the vertex

3. $y = x^2 + 2x + 3$



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

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

$x = -1$

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

$= 1 - 2 + 3$

$= 2$

vertex $(-1, 2)$

x	y
-3	6
-2	3
-1	2
0	3
1	6

minimum!

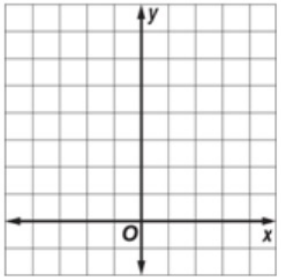
2

D: $\mathbb{R}$

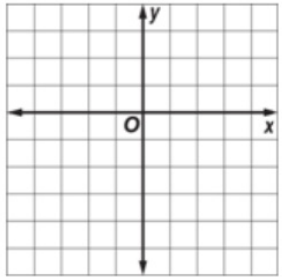
R: $y \geq 2$

Consider each equation. Determine whether the function has *maximum* or *minimum* value. State the maximum or minimum value and the domain and range of the function. Find the equation of the axis of symmetry. Graph the function.

1. $y = x^2 + 3$



2. $y = -x^2 - 4x - 4$



3. $y = x^2 + 2x + 3$