

Describe the characteristics of the following graphs:

**Example 8:**

Vertex:  $(1, 0)$  Axis of Symmetry:  $x = 1$   
 Extrema:  $\text{min}$  Max/Min Value:  $y = 0$   
 Domain:  $\mathbb{R}$  Range:  $y \geq 0$   
 $a > 0$  Y-Intercept:  $(0, 1)$   
 X-Intercepts:  $(1, 0)$  Zeros:  $x = 1$   
 Int. of Increase:  $1 < x < \infty$  *x values*  
 Int. of Decrease:  $-\infty < x < 1$   
 End Behavior: As  $x \rightarrow -\infty, y \rightarrow +\infty$   
 As  $x \rightarrow \infty, y \rightarrow +\infty$   
 Rate of change on the interval  $-1 < x < 3$   $0$   
 $(-1, 4) (3, 4)$   
 $\frac{4-4}{3-(-1)} = \frac{0}{4} = 0$

**Example 9:**

Vertex:  $(-2, 4)$  Axis of Symmetry:  $x = -2$   
 Extrema:  $\text{max}$  Max/Min Value:  $y = 4$   
 Domain:  $\mathbb{R}$  Range:  $y \leq 4$   
 $a < 0$  Y-Intercept:  $(0, 0)$   
 X-Intercepts:  $(-4, 0) (0, 0)$  Zeros:  $x = -4, 0$   
 Int. of Increase:  $-\infty < x < -2$   
 Int. of Decrease:  $-2 < x < \infty$   
 End Behavior: As  $x \rightarrow -\infty, y \rightarrow -\infty$   
 As  $x \rightarrow \infty, y \rightarrow -\infty$   
 Rate of change on the interval  $-1 < x < 3$   $1$   
 $(-1, 3) (-4, 0)$   
 $\frac{0-3}{-4+(-1)} = \frac{-3}{-5} = 1$

**Example 10:**  
 Given the equation  $y = 3x^2 - 4x + 5$ , calculate the average rate of change using the interval  $-1 < x < 7$ .  
 $(-1, 12)$   $(7, 124)$   $\frac{124-12}{7-(-1)} = \frac{112}{8} = 14$   
 $y = 3(-1)^2 - 4(-1) + 5 = 12$   $y = 3(7)^2 - 4(7) + 5 = 124$