

### 3.1 Quadratic Functions

Day 1 ①

$$f(x) = ax^2 + bx + c$$

#### Parabola

Domain:  $(-\infty, \infty)$

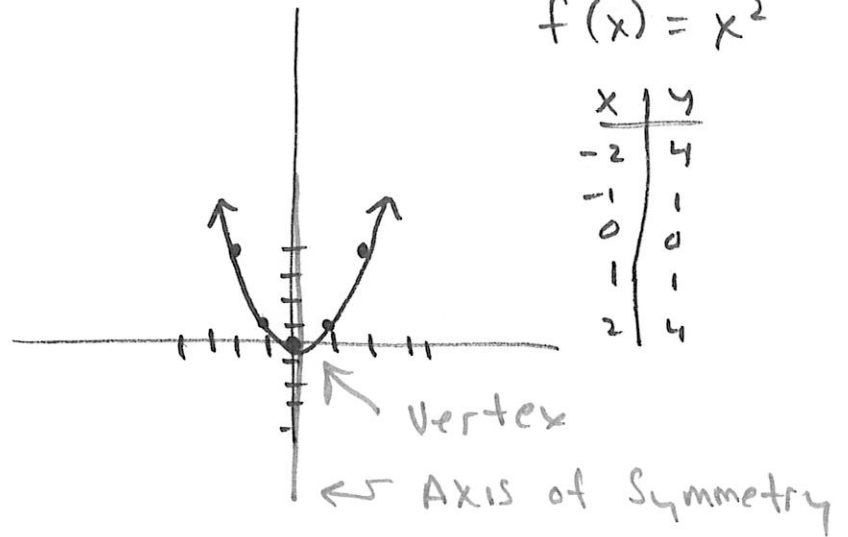
Range  $[0, \infty)$

Axis  $x=0$

Increase  $(0, \infty)$

Decrease  $(-\infty, 0)$

↑  
(x-values)



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

↑ flip over x-axis  
 ↑ vertical stretch/compress  
 ↔ horizontal shift  
 ↑ vertical shift

Vertex:  $(h, k)$

Ex:  $f(x) = (x-2)^2 + 3$   
 Vertex  $(2, 3)$

x-value of vertex →

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

3.1 #31  $f(x) = x^2 - 10x + 21$

Day 1 (2)

a) vertex  $(5, -4)$

d) range  $[-4, \infty)$

b) axis  $x = 5$

e) increasing  $(5, \infty)$

c) domain  $(-\infty, \infty)$

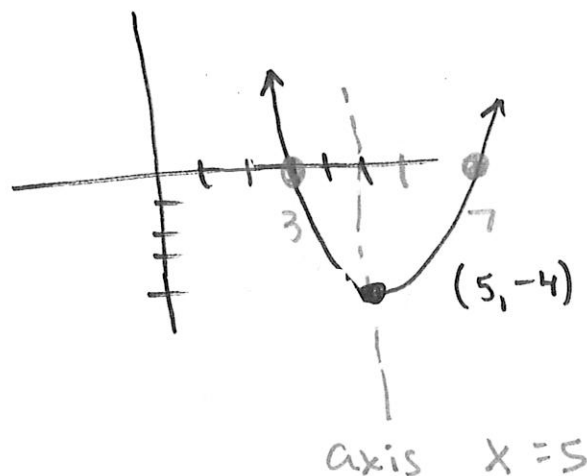
f) decreasing  $(-\infty, 5)$

Vertex:  $x = \frac{-b}{2a}$      $a = 1$      $b = -10$      $c = 21$

$x = \frac{-(-10)}{2(1)} = \frac{10}{2} = 5$

$f(5) = 5^2 - 10(5) + 21 = 25 - 50 + 21 = -4$

Vertex:  $(5, -4)$



y-intercept ( $x = 0$ )

$f(0) = 0^2 - 10(0) + 21$

$y = 21$

x-intercept ( $y = 0$ )

$0 = x^2 - 10x + 21$      $\begin{array}{r} 21 \quad | \quad -10 \\ -7(-3) \quad | \quad -7-3 = \\ \hline \quad \quad \quad | \quad -10 \end{array}$

$0 = (x-7)(x-3)$

$x-7=0$   
+7 +7

$x-3=0$   
+3 +3

$x = 7$

$x = 3$