Module 4: Lesson 17

Graphing Quadratic Functions from the Standard Form, $f(x) = ax^2 + bx + c$

Pg. 100

1. Graph the function $n(x) = x^2 - 6x + 5$, and identify the key features.

Factor, Quadratic Formula

1. Find the x-intercepts $a=1$ $b=-6$ $c=5$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(5)}}{2(1)} = \frac{6 \pm \sqrt{36-20}}{2}$$

$$= \frac{6 \pm \sqrt{16}}{2} = \frac{6 \pm 4}{2}$$

$x = \frac{6+4}{2}$ $\quad x = \frac{6-4}{2}$

$x = \frac{10}{2}$ $\quad x = \frac{2}{2}$

$x = 5$ $\quad x = 1$

2. Find the y-intercept (Set $x = 0$) $\quad c = 5$

$n(0) = 0^2 - 6(0) + 5$

$= 0 + 0 + 5$

$= 5$

3. Find the Axis of Symmetry

$x = \frac{-b}{2a}$ $\quad a=1$ $\quad b=-6$

$x = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$

$x = 3$

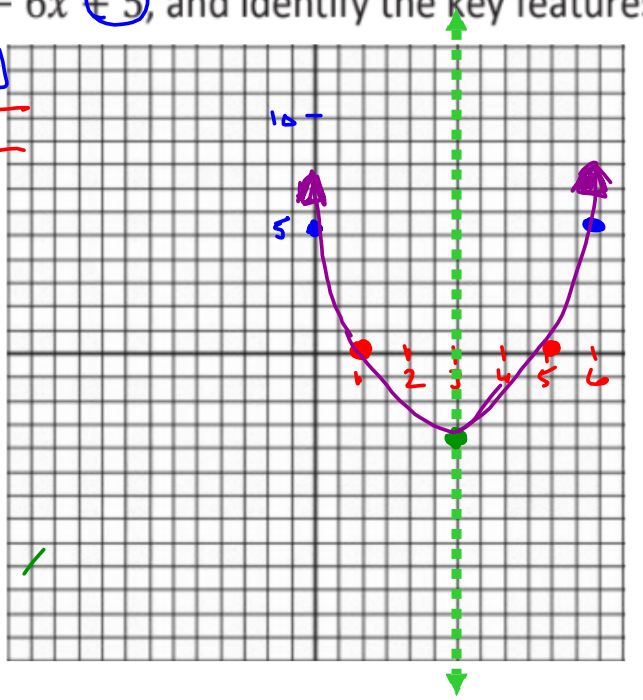
4. Find the Vertex

$n(3) = (3)^2 - 6(3) + 5$

$= 9 - 18 + 5$

$= -9 + 5$ $\quad (3, -4)$

$= -4$



State the **Domain** (x-values that can go into the function):

(Inputs gives us an output)

- $(-\infty, \infty)$

OR

- ALL Real Numbers

State the **Range** (y-values that can come out of the function):

- ALL numbers greater than or equal to -4.

OR

- $[-4, \infty)$

4. A student throws a bag of chips to her friend. Unfortunately, her friend does not catch the chips, and the bag hits the ground. The distance from the ground (height) for the bag of chips is modeled by the function $h(t) = -16t^2 + 32t + 4$, where h is the height (distance from the ground in feet) of the chips, and t is the number of seconds the chips are in the air.

a. Graph h.

$a=-16$ $b=32$ $c=4$

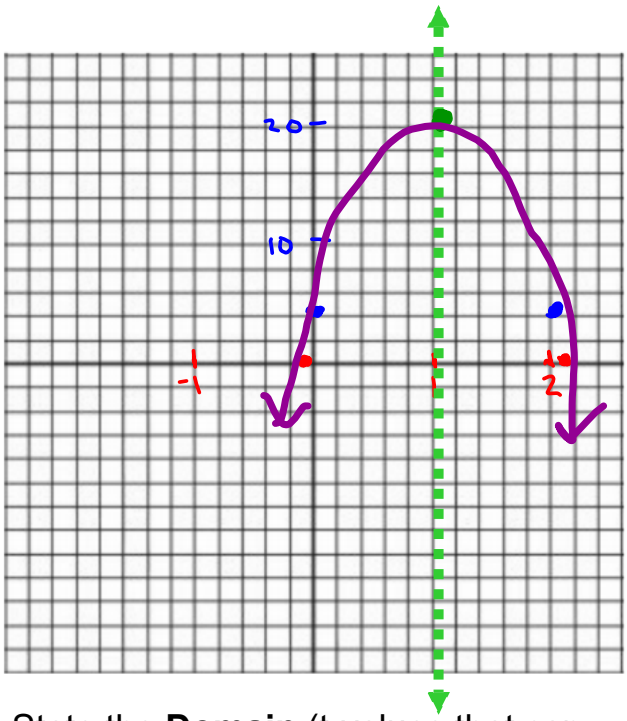
1. Find the x-intercepts

$x = \frac{-(32) \pm \sqrt{(32)^2 - 4(-16)(4)}}{2(-16)} = \frac{-32 \pm \sqrt{1024+256}}{-32} = \frac{-32 \pm \sqrt{1280}}{-32}$

$= \frac{-32 \pm 35.78}{-32}$

$x = -0.12$

$x = 2.12$



2. Find the y-intercept

y-int: $c=4$

3. Find the Axis of Symmetry

$x = \frac{-b}{2a}$ $a=-16$ $b=32$

$x = \frac{-(32)}{2(16)} = \frac{-32}{-32} = 1$

State the **Domain** (t-values that can go into the function):

State the **Range** (y-values that can come out of the function):

4. Find the Vertex

$h(t) = -16t^2 + 32t + 4$

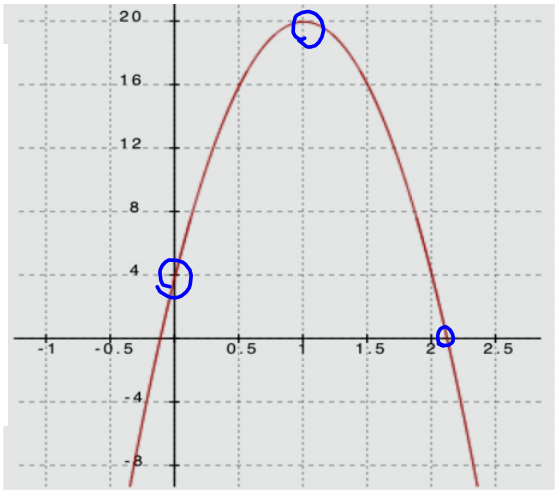
$h(1) = -16(1)^2 + 32(1) + 4$

$= -16 + 32 + 4$

$= 20$

$(1, 20)$

4. A student throws a bag of chips to her friend. Unfortunately, her friend does not catch the chips, and the bag hits the ground. The distance from the ground (height) for the bag of chips is modeled by the function $h(t) = -16t^2 + 32t + 4$, where h is the height (distance from the ground in feet) of the chips, and t is the number of seconds the chips are in the air.



From what height are the chips being thrown? Tell how you know.

Since at $t=0$ the height is 4. We can conclude that the starting height is 4 feet.

What is the maximum height the bag of chips reaches while airborne? Tell how you know.

The maximum height of the bag of chips is 20 feet. We can tell this by the position of the vertex.

How many seconds after the bag was thrown did it hit the ground?

The bag hit the ground at about 2.12 seconds.