lulumath

What Can Real Life Do to Restrict Domain and Range?

Video Notes

Video Link

What Can Real Life Do to Restrict Domain and Range?

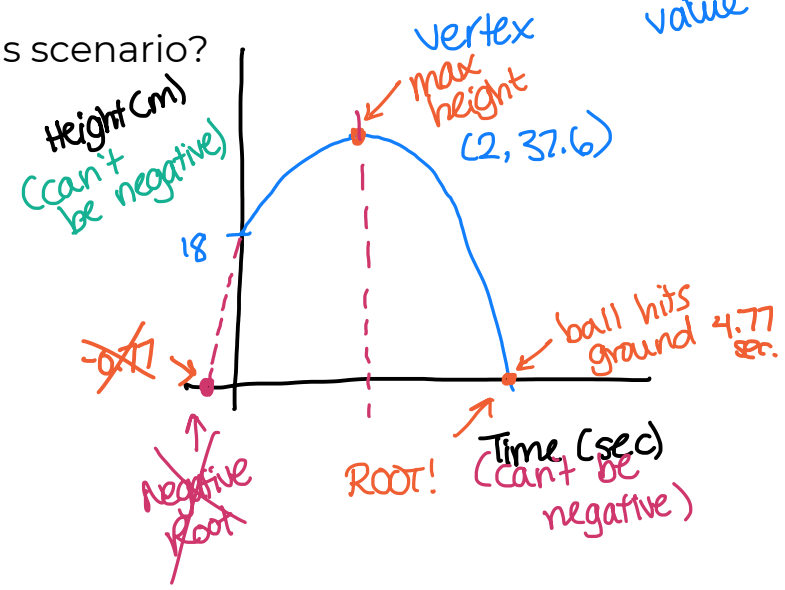
Background Knowledge:

- Domain and range
- Key features of quadratic relations - roots and vertices

While standing on top of a building, Claire threw a ball in the air. The height of the ball, y, in meters, is represented by the equation $y = -4.9x^2 + 19.6x + 18$, where x represents the time in seconds.

initial value

What are the domain and range of this scenario?



* Let's find the root.

$y = ax^2 + bx + c$

$y = -4.9x^2 + 19.6x + 18$

~~• factoring~~
• completing the square
• quadratic formula. ✓

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = -4.9$
$b = 19.6$
$c = 18$

$$x = \frac{-19.6 \pm \sqrt{(19.6)^2 - 4(-4.9)(18)}}{2(-4.9)}$$

$$x = \frac{-19.6 \pm \sqrt{736.96}}{-9.8}$$

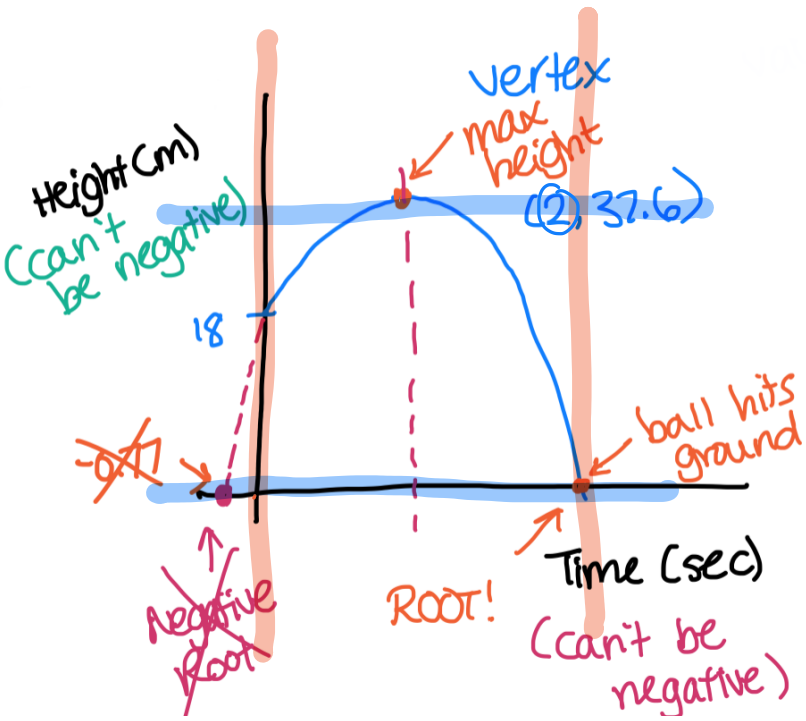
$$x = \frac{-19.6 + \sqrt{736.96}}{-9.8} \quad \text{OR} \quad x = \frac{-19.6 - \sqrt{736.96}}{-9.8}$$

$x \doteq -0.77$ OR $x \doteq 4.77$

* Find vertex

$$x = -\frac{b}{2a} = \frac{-19.6}{2(-4.9)} = \frac{-19.6}{-9.8} = 2$$

$y = -4.9x^2 + 19.6x + 18$
$y = -4.9(2)^2 + 19.6(2) + 18$
$y = -4.9(4) + 19.6(2) + 18$
$y = -19.6 + 39.2 + 18$
$y = 37.6$



$D = \{x \in \mathbb{R} \mid 0 \leq x \leq 4.77\}$

$[0, 4.77]$

$R = \{y \in \mathbb{R} \mid 0 \leq y \leq 37.6\}$

$[0, 37.6]$