

Example In the (North American) football, a field goal can be scored by kicking the ball between the goal posts in the opponents end zone. For a kick in a particular game, the height of the ball above the ground, y , in metres, can be modelled by the function

$$y = -4.9x^2 + 25x$$

where x is the time in seconds after the ball left the foot of the player.

- a. Determine the maximum height that this kick reached, to the nearest tenth of a metre.

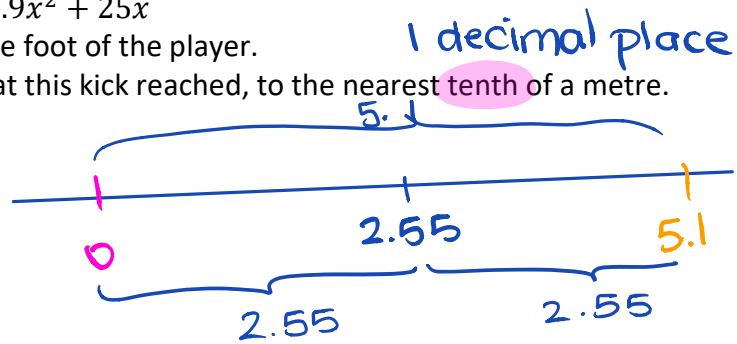
Step 1: Factor

$$y = -4.9x(x - 5.1)$$

Step 2: Find zeros

$$x = 0 \quad x - 5.1 = 0$$

$$x = 5.1$$



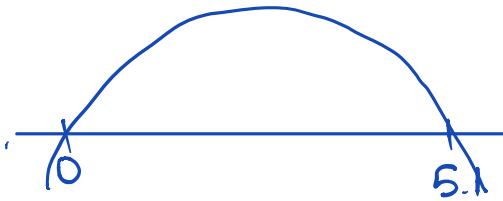
$$y = -4.9(2.55)^2 + 25x$$

$$= -31.9 + 63.75$$

$$= 31.85$$

$$\approx 31.9 \text{ m}$$

- b. State any restrictions that the context imposes on the domain and range of this function.



$$\text{Domain: } 0 \leq x \leq 5.1$$

$$\text{Range: } 0 \leq y \leq 31.9$$

↑ can't go below ground.
↑ max height

- c. How long was the ball in the air?

5.1 seconds.