

4.5 - Applications of Quadratics

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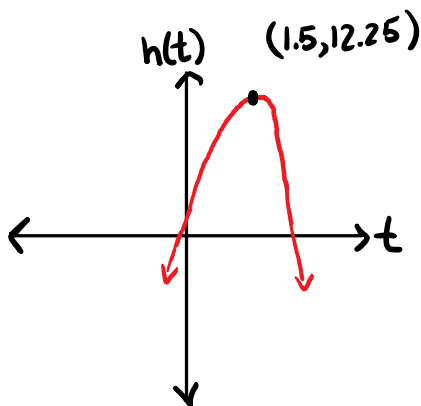
Quadratic functions can be used to describe a number of situations, particularly the flight of objects through the air.

For example, we can describe the flight of a football that is kicked using a quadratic equation:

$$h(t) = -5(t - 1.5)^2 + 12.25$$

Where “ t ” is the amount of time, in seconds, which have elapsed since the ball was kicked, and $h(t)$ is the height of the football, in meters, above the ground after t seconds.

We could graph this, but let’s just make a quick sketch to help us determine some interesting points:



i. What’s the maximum height the football reaches?

Handwritten: Highest point occurs at the vertex

∴ 12.25m

ii. What is the time it takes for the football to reach its maximum height?

∴ 1.5s

iii. What's the height of the ball the moment the player kicks the ball?

$$h(t) = -5(t-1.5)^2 + 12.25$$

$$h(0) = -5((0)-1.5)^2 + 12.25$$

$$= -5(2.25) + 12.25$$

$$h(0) = 1$$

$\hookrightarrow t=0$

∴ The height at the moment of contact is 1m.

iv. What is the height of the ball 0.5 seconds after the player kicks the ball?

$$h(t) = -5(t-1.5)^2 + 12.25$$

$$h(0.5) = -5[(0.5)-1.5]^2 + 12.25$$

$$= -5(1) + 12.25$$

$$= 7.25\text{m}$$

∴ 0.5s after the football was kicked, it was 7.25m high.