

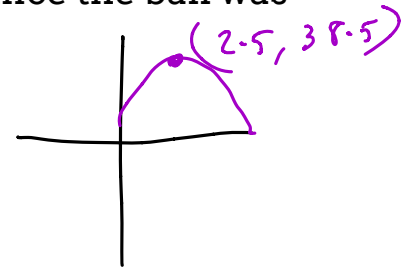
Quadratic Functions Word Problems

Ex. #1: The following function gives the height, $h(t)$ metres, of a batted baseball as a function of the time, t seconds, since the ball was hit:

$$h(t) = -6(t - 2.5)^2 + 38.5$$

- (a) What is the maximum height of the ball?

$$h = 38.5$$



- (b) What was the height of the ball when it was hit?

$$\begin{aligned} h(t) &= -6(0 - 2.5)^2 + 38.5 \\ &= -6(2.5)^2 + 38.5 \\ &= 1 \text{ m} \end{aligned}$$

- (c) How many seconds after the ball was hit did the ball hit the ground, to the nearest second?

$$\begin{aligned} h(t) &= -6(t - 2.5)^2 + 38.5 \\ 0 &= -6(t - 2.5)^2 + 38.5 \end{aligned}$$

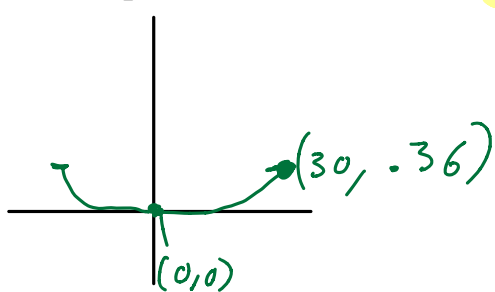
$$\begin{aligned} \pm \sqrt{\frac{-38.5}{-6}} + 2.5 &= t \\ \boxed{5.0 = t} \end{aligned}$$

$$\text{or } -0.03 = t$$

- (d) Find the height of the ball 1s after it was hit?

$$\begin{aligned} h(t) &= -6(t - 2.5)^2 + 38.5 \\ h(1) &= -6(1 - 2.5)^2 + 38.5 \\ &= 25 \text{ m} \end{aligned}$$

Ex. #2: The mirror from a telescope has a diameter of 60cm and a maximum depth of about 0.36cm. Suppose a coordinate grid is placed at the vertex, write an equation for the curve.



$$y = A(x - p)^2 + q$$

$(0, 0)$

$$.36 = a(30)^2$$

$$\frac{.36}{30^2} = a$$

$$0.0004 = a$$

$$y = .0004x^2$$

Ex. #3: A theatre company has 300 season ticket subscribers. The theatre has decided to raise the price of a season ticket from its current price of \$400. A survey of the subscribers has determined that for every \$20 increase in price, 10 subscribers would not renew their seasons tickets.

(a) What is the maximum revenue the theatre will generate?

max rev @ \$125,000

$$R = Pq$$

$n \rightarrow \text{number}$

$$R(n) = (400 + 20n)(300 - 10n)$$

$$= 120000 - 4000n + 6000n - 200n^2$$

$$= -200n^2 + 2000n + 120000$$

$$= -200(n^2 - 10n) + 120000$$

$$= -200(n - 5)^2 + 25(200) + 120000$$

$$= -200(n - 5)^2 + 125,000$$

(b) What ticket price will maximize revenue?

$$\text{ticket} = \$400 + 5(20)$$

$$= \$500$$