PreCalculus 11 Name_____
Date_____

Quadratic Applications

Type 1* – *Equation Given, then information required

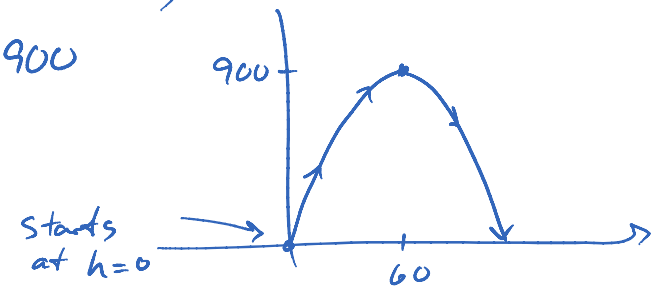
Example 1: A watermelon launched from a catapult has a height given by the equation:

$h(t) = -0.25t^2 + 30t$ h = height in m t = time in sec

$h = -0.25(t^2 - 120t)$

$h = -0.25(t^2 - 120t + 3600 - 3600)$

$h = -0.25(t-60)^2 + 900$



a. What is the maximum height the watermelon reaches? When?

900m after 60 sec.

b. What is the height at 10 sec? 20 sec?

$h(10) = -0.25(10)^2 + 30(10) = 275m$ $h(20) = 500m$

c. When does it hit the ground?

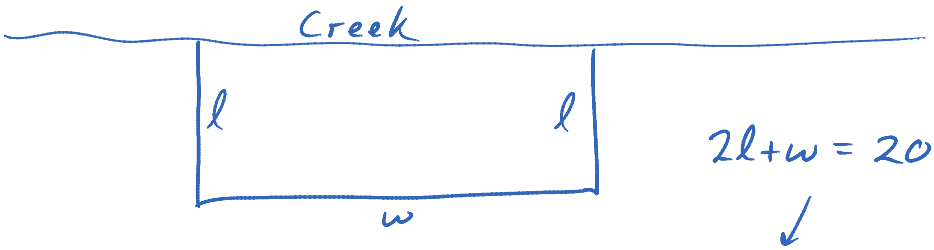
at 120 sec (symmetry of parabola, time up = time down)

d. What is the difference if the equation is changed to $h(t) = -0.25t^2 + 30t + 100$?

Now starting at an initial height of 100m.

Type 2 – Min/Max problem - equation not given

Example 2: A rectangular area is to be fenced in beside a creek, but the fencing needs to be doubled along a perfectly straight creek. What is the maximum area fenced in with 200m of fencing?



$2l + w = 200$

$w = 200 - 2l$

$\text{Area} = l \times w$

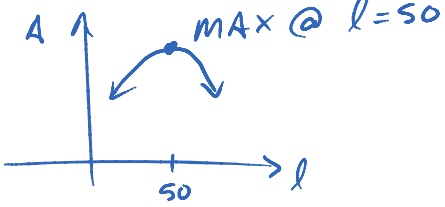
$A = l(200 - 2l)$

$A = -2l^2 + 200l$

$A = -2(l^2 - 100l)$

$A = -2(l^2 - 100l + 2500 - 2500)$

$A = -2(l - 50)^2 + 5000$



$\therefore$ maximum occurs when $l = 50$ m

& $\therefore$ $w = 200 - 2(50)$

$= 100$ m

$\text{Max Area} = 5000\text{ m}^2$

Example 3: At the last school dance, Student Council charged $12 per ticket, and 400 students attended. They estimate that for every $1 increase in cost, approximately 20 fewer students will attend. Find the ticket price that will result in the maximum revenue for the dance.

Last Dance : $Rev = (\text{price per ticket})(\#\text{ of tickets})$

$= (\$12)(400)$

$= \$4800$.

Let x = # of $\$1$ increases in price.

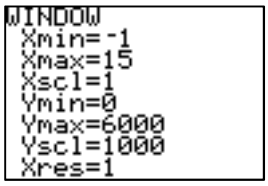
Now, $Rev = (\text{price})(\text{Number})$

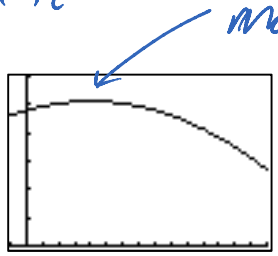
$= (12 + 1x)(400 - 20x)$

$= 4800 - 240x + 400x - 20x^2$

$R = -20x^2 + 160x + 4800$

Graph it'





$\therefore$ 4 cost increases!

Ticket price should be $16, and Revenue will be $5120

Assignment: p. 176 # 11, 17 p. 194 # 14, 18, 19, 22