3.4 Quadratic Models

1.) the max and min of quadratic allows us to answer questions about optimization

Optimization is the process of finding the greatest or least value of a function for some constraint, which must be true regardless of the solution. In other words, **optimization** finds the most suitable value for a function within a given domain.

In Economics, Revenue (R) is equal to the price (p) of an item multiplied by the number of items (x) you sell.

$$R = xp$$

Example

If 5 computers are sold at $1000 each then

R = 5 x $1000
R = $5,000

*Remember our Demand and Supply equation, where price (p) for equilibrium, was determined by the D(p) and S(p) equations.

The equilibrium price set the price and quantity where the two Linear equations met, where equal to each other.

In Economics the Law of Demand states:

That p and x are related. As one increases, the other decreases.
(the equation that relates p and x is called: **demand equation**)

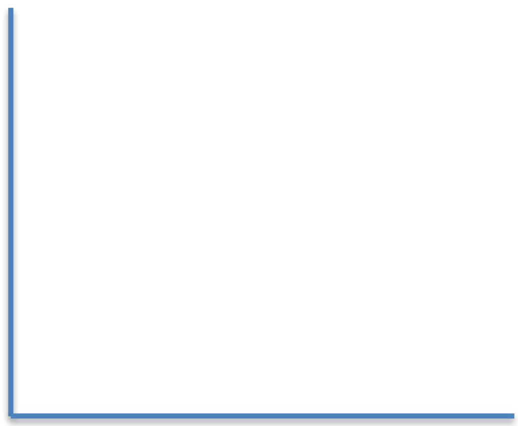
EXAMPLE of the quadratic model:
Calculators sold at a certain price (p) dollars per unit and the number (x) sold is given by:

if $x = (21{,}000 - 150p)$ (x and p are related)

REMEMBER $R = xp$ *R is revenue

then $R = (21{,}000 - 150p)\, p$

or $R = 21{,}000p - 150p^2$

Shape is 

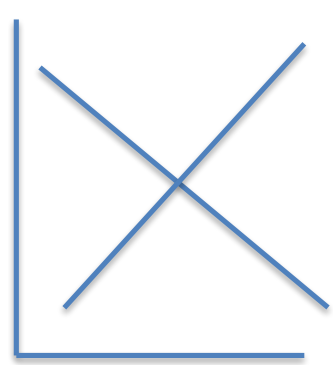
1.) $R = 2100p - 150p^2$ is the model of the quadratic

2.) What is the domain of R

We must know/analyze x the number of items sold. Or solve the Linear inequality associated with x

$X \geq 0$ must sell positive items *S(p) and D(p)

$x = 21{,}000 - 150p$



so $p \leq 140$

also we

want $x > 0$ and a positive(whole) integer

Therefore $0 < x \leq 140$

3.) what unit price should we use to maximize revenue?

solve for p (p is the independent variable)

$p = -b/2a$

4.) If this price is charged what will be the maximum revenue?

Plug in the price to find Revenue (R)

5.) How many units are sold at this price?

Solve for x now $x = 21{,}000 - 150\ (\ )$

6.) Graph R

7.) What price should charged if you want to collect at least $675,000 of revenue?

Enclosed Fence problem

2000 yards of fence are used to enclose a rectangular field.

$$A = x\ w$$

What are the dimensions that encloses the most area?

Recall $2l + 2\ w = A$

To solve with a quadratic we need to solve one variable for the other

1.

Then we need to write the quadratic

2.

Find the best dimensions. Find the maximum x value

3.