Warm-Up

$$f(x)=6x^2 + 12x +11$$

Determine the vertex by

Partial Factoring

$f(x) = 6x^2 + 12x$

$= 6x(x+2)$

zeros $\quad 0 \quad -2$

AOS $\quad x = -1$

$f(-1) = 5$

$\therefore (-1, 5)$

Completing the Square

$f(x) = 6(x^2 + 2x) + 11$

$= 6(x^2 + 2x + 1 - 1) + 11$

$= 6(x^2 + 2x + 1) - 6 + 11$

$= 6(x+1)^2 + 5$

$\therefore (-1, 5)$

Determining

Max / Min Values

Learning Goals
- **investigate Max / Min word problems**

Revenue, Profit and Cost

Revenue - all the money you take in

Cost - money you spend

Profit = Revenue - Cost

Revenue

R(x) = (price)(number of items sold)

Note:- Price may also depend on the number of items sold

- This is called a Demand Function

p(x)

- R(x)=p(x)•x

\# of items

MCR3U *3.2 Determining Maximum and Minimum Values of Quadratic Functions*

The ***Demand Function*** for a new widget can be modeled by $p(x) = -5x + 33$ where *p(x)* represents the selling price of the widget and *x* is the number sold in thousands.

The ***Cost Function*** is $C(x) = 3x + 35$.

Determine the ***Revenue Function*** and the ***Profit Function***

How many widgets should be sold to maximize profits and what is the maximum profit?

Revenue

$R(x) = p(x)\cdot x$

$= (-5x + 33)(x)$

$= -5x^2 + 33x$

Profit

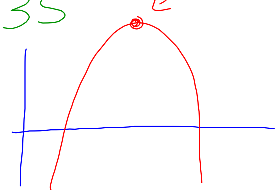
$=$ Revenue $-$ Cost

$= -5x^2 + 33x - (3x + 35)$

$= -5x^2 + 33x - 3x - 35$

$= -5x^2 + 30x - 35$

max profit



Convert the profit function to Vertex Form

$$P(x) = -5x^2 + 30x - 35$$
$$= -5(x^2 - 6x) - 35$$
$$= -5(x^2 - 6x + 9 - 9) - 35$$
$$= -5(x^2 - 6x + 9) + 45 - 35$$
$$= -5(x-3)^2 + 10$$

Determine how many widgets should be sold to maximize profits and determine the maximum profit.

vertex $(3, 10)$ max profit

$\$10.\underbrace{00}_{\text{show cents}}$

3000 widgets were sold

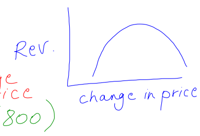
1. The cost of a ticket to a hockey arena seating 800 people is $3.00. At this price, every ticket is sold. A survey indicates that if the price is increased, attendance will fall by 100 for every dollar ticket prices increase.

   a. What ticket price results in the greatest revenue?

   b. What is the greatest revenue?

Cost	tickets sold	revenue
3	800	2400
4	700	2800
5	600	3000
6	500	3000
⋮	⋮	⋮
11	0	0

Revenue = (cost)(tickets sold)



Let x rep. the change in price

Now $R = (3)(800)$

Later $R = (3 + x)(800 - 100x)$

zeros $3 + x = 0$, $x = -3$ $800 - 100x = 0$, $800 = 100x$, $8 = x$

AOS $x = \frac{-3+8}{2} = \frac{5}{2}$

$R\left(\frac{5}{2}\right) = \left(3 + \frac{5}{2}\right)\left(800 - 100\left(\frac{5}{2}\right)\right)$

$= 3025$

$\therefore$ vertex $(2.5, 3025)$

new price $3 + 2.5 = 5.50$

max revenue $\$3025.00$

On the Boards...

A resort hotel has rooms available at a standard rate of \$150 per night. During the non-holiday season 100 rooms are rented each day (on average). Research has shown that for each \$20 price reduction, 25 more rooms will be rented. What non-holiday price should be advertised to maximize revenue?

Let x rep. the number of changes

Now $y = 100(150)$

Later $y = (100 + 25x)(150 - 20x)$

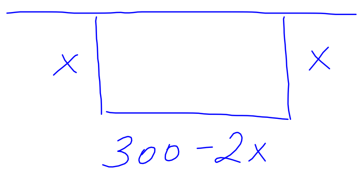
zeros -4, 7.5

AOS $x = 1.75$

price $= 150 - 20(1.75)$
$= 115$

On the Boards...

A rectangular play area adjacent to a building is to be fenced in with 300 meters of fencing. Find the maximum area that can be fenced and the dimensions of the play area.



$A = (300 - 2x)(x)$

zeros 150, 0

AOS $x = 75$

Area $= (300 - 2(75))(75)$
$= 11250$

Seatwork

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