M.I. Maximum Revenue

Do Now:
Given the system of 2 equations, use algebra to create one equation in standard form.

$$3x^2 + 2y^2 - 54y - 143 = 0$$
$$x = 3y + 3$$

$$3(3y+3)^2 + 2y^2 - 54y - 143 = 0$$
$$3(9y^2 + 18y + 9) + 2y^2 - 54y - 143 = 0$$
$$27y^2 + \cancel{54y} + 27 + 2y^2 - \cancel{54y} - 143 = 0$$
$$\frac{29y^2}{29} - \frac{116}{29} = \frac{0}{29}$$
$$y^2 - 4 = 0$$
$$(y+2)(y-2) = 0$$
$$y = -2 \qquad y = 2$$
$$x = ? \qquad x = ?$$

- What is **revenue**?

  the amount of $ you bring in as a result of sales.

The revenue of a product or service can depend on its price in two ways.

1. An increase in price means that more revenue per unit is earned but less units are sold.

2. A decrease in price means that less revenue is earned per unit but more units are sold.

In the next problems, a current price and sales amount will be given and how a price increase or decrease will affect the sales level.

A cinema multiplex averages 2000 tickets sold on a Saturday when ticket prices are \$8. A research firm has determined that for each \$0.25 increase in the ticket price, 50 fewer tickets will be sold.

revenue \$16,000

What is the maximum revenue and what ticket price maximizes the revenue?

\$16,087 x= 1 increase = \$8.25 , 1950 people

16,150... x= 2 increases = \$8.50 , 1900

...

Let x = # of \$0.25 ticket increases

$8 + .25x$ = Ticket price ← rate of change (slope)

$2000 - 50x$ = Avg # of Tickets sold ← rate of change

To Get Revenue:

- Ticket Revenue: (multiply # of tickets) × (cost/price per ticket)

$R(x) = (2000 - 50x)(8 + .25x)$

$= 16000 + 500x - 400x - 12.5x^2$

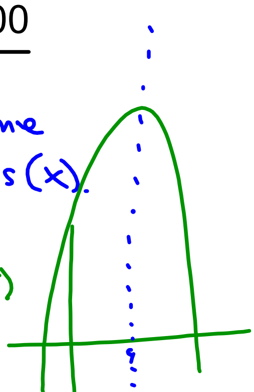
$R(x) = -12.5x^2 + 100x + 16,000$

Used to determine the max revenue as a function of the # increases (x).

A.O.S = $x = -\frac{b}{2a} = \frac{-100}{2(-12.5)}$

$x = \frac{-100}{-25}$

$x = 4$ increases



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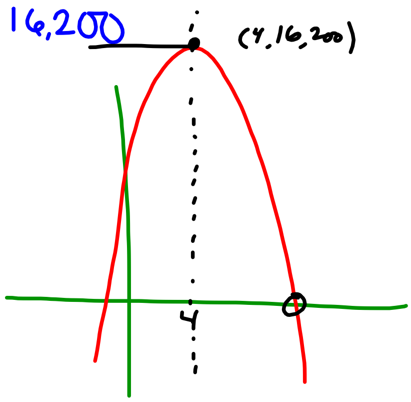
$R(4) = -12.5(4)^2 + 100(4) + 16,000$

$= \$16,200$

If we raise the ticket price 4 times to \$9.00, then we will get a max revenue of \$16,200.



The John Deere company has found that the revenue from sales of heavy-duty tractors is a function of the unit price p that it charges. The revenue R is

$$R = -\frac{1}{2}p^2 + 1900p$$

What unit price p should be charged to maximize revenue? What is the maximum revenue?

A management firm has determined that 60 apartments in a complex can be rented if the monthly rent is \$900, and that for each \$50 increase in the rent, three tenants are lost with little chance of being replaced.

What rent should be charged to maximize revenue?

What is the maximum revenue?

let x = # of \$50 increases

- let $60 - 3x$ = avg # tenants
- let $900 + 50x$ = avg cost per apartment

$$R(x) = (60 - 3x)(900 + 50x)$$

The price p and the quantity x sold of a certain product obey the demand equation below.

$x = -7p + 112, \quad 0 \leq p \leq 20$

(a) Express the revenue R as a function of x.
(b) What is the revenue if 63 units are sold?
(c) What quantity x maximizes revenue? What is the maximum revenue?
(d) What price should the company charge to maximize revenue?
(e) What price should the company charge to earn at least $336 in revenue?