

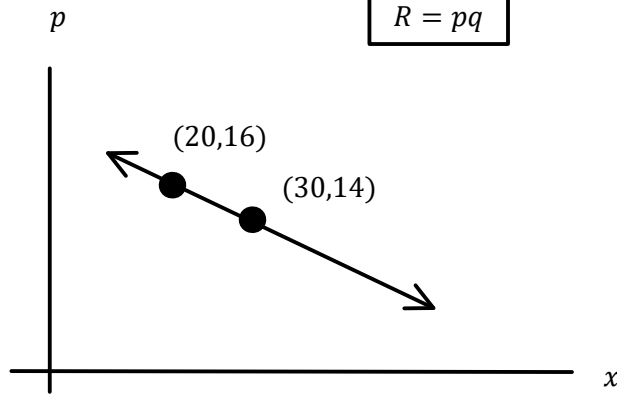
C12 - 4.5 - Demand Profit Max

16\$ units sell 20 units.
14\$ units sell 30 units.

Find q to max R

$$C = 4x + 140$$

p = price
 x = quantity
 R = Revenue
 C = Cost
 P = Profit



$$R = pq$$

$$P = R - C$$

x	p	R	C	P
20	16	320	240	120
30	14	420	260	160

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{16 - 15}{20 - 30}$$

$$y - y_1 = m(x - x_1)$$

$$p - 16 = -\frac{1}{5}(x - 20)$$

$$R = px$$

$$R = \left(-\frac{1}{5}x + 20\right)x$$

$$R = -\frac{1}{5}x^2 + 20x$$

$$P = R - C$$

$$P = -\frac{1}{5}x^2 + 20x - (4x + 140)$$

$$m = -\frac{1}{5}$$

$$p = -\frac{1}{5}x + 20$$

$$R = -\frac{1}{5}x^2 + 20x$$

$$P = -\frac{1}{5}x^2 + 16x - 140$$

Down \$1 Sell 5 more

Demand Function

$$p = -\frac{1}{5}x + 20$$

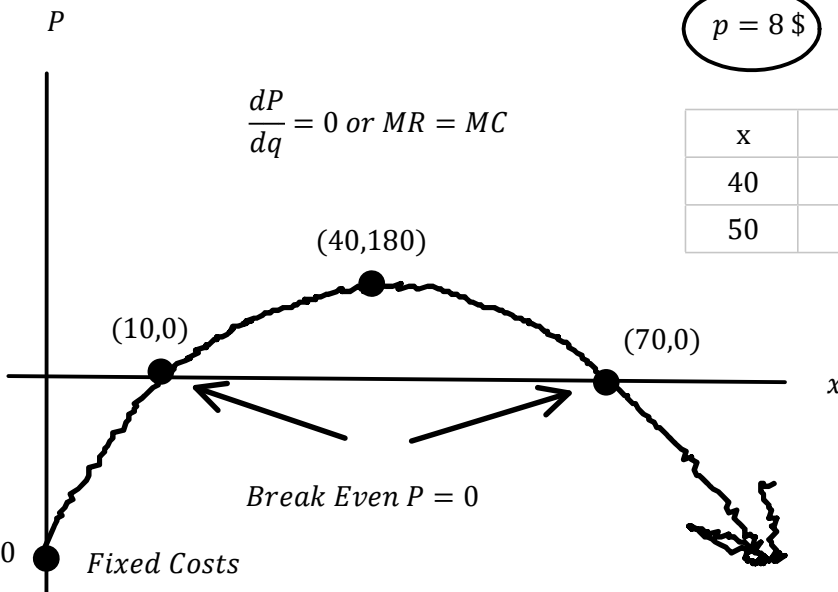
$$\frac{dP}{dx} = -\frac{2}{5}x + 16$$

$$0 = -\frac{2}{5}x + 16$$

$$p = -\frac{1}{5}x + 20$$

$$x = 40 \text{ units}$$

$$p = 8 \$$$



x	p	R	C	P
40	8	480	300	180
50	10	500	340	160

Max Profit

$$MR = MC$$

$$-\frac{2}{5}x + 20 = 4$$

$$x = 40$$

$R = pq$ $R = (16 - 1x)(20 + 5x)$ $R = -5x^2 + 60x + 320$ $\frac{dR}{dx} = -10x + 60$ $0 = -10x + 60$ $x = 6$	$x = \# p \text{ decreases}$ $- \$1 q \text{ down, } q + 5$ $R = -5x^2 + 60x + 320$ $R = -5(6)^2 + 60(6) + 320$ $R = 500$ 6 price decrease, Max Revenue	$Down \$6, Rev = 500$
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C12 - 4.5 - Growth Elasticity Max Rev Notes

$$F'(500\$) = ? ; F(500\$) \quad k = 5\% \quad F = Pe^{kt}$$

$$F = Pe^{kt}$$

$$F = Pe^{0.05t}$$

$$F' = Pe^{0.05t} \times 0.05$$

$$F = Pe^{kt}$$

$$F = Pe^{0.05t}$$

$$500 = Pe^{0.05t}$$

$$\frac{500}{P} = e^{0.05t}$$

$$\ln\left(\frac{500}{P}\right) = 0.05t \ln e$$

$$t = \frac{\ln\left(\frac{500}{P}\right)}{0.05}$$

$$F' = Pe^{0.05t} \times 0.05$$

$$F' = Pe^{0.05 \frac{\ln\left(\frac{500}{P}\right)}{0.05}} \times 0.05$$

$$F' = Pe^{\ln\left(\frac{500}{P}\right)} \times 0.05$$

$$F' = P \left(\frac{500}{P}\right) \times 0.05$$

$$e^{\ln\left(\frac{500}{P}\right)} = \frac{500}{P}$$

$$e^{\ln a} = a$$

$$F' = 25 \frac{\$}{\text{year}}$$

$$q(p) = q$$

Quantity is a function of Price

$$R = pq$$

$$\frac{DR}{dp} = \frac{dp}{dp}q + \frac{dq}{dp}p$$

$$\frac{DR}{dp} = p \frac{dq}{dp} + q$$

Product
Rearrange
 $\frac{dp}{dp} = 1$

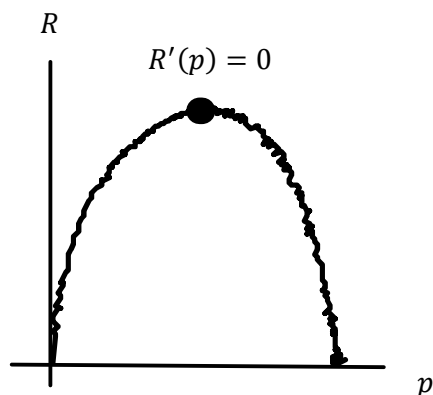
$$\frac{DR}{dp} = q\left(\frac{p}{q} \frac{dq}{dp} + 1\right)$$

Factor

$$\frac{DR}{dp} = q(E + 1)$$

$$E(p) = \frac{p}{q} \frac{dq}{dp}$$

Elasticity



Price vs Quantity

$$q + 50p^2 = 240$$

Find q to max Rev

$$q + 5p^2 = 240$$

$$\frac{dq}{dp} + 10p \frac{dp}{dp} = 0$$

$$\frac{dp}{dp} = 1$$

$$\frac{dq}{dp} = -10p$$

Sell 10 less each increase in \$p

$$E(p) = \frac{p}{q} \frac{dq}{dp}$$

$$E(p) = \frac{p}{q} \times -10p$$

$$E(p) = -\frac{10p^2}{q}$$

$$-1 = -\frac{10p^2}{q}$$

$$q = 10p^2$$

$$q + 50p^2 = 240$$

$$10p^2 + 50p^2 = 240$$

$$60p^2 = 240$$

$$p^2 = 4$$

$$p = 2$$

$$E(p) = -1 ; @ \text{ max}$$

$$q = 5p^2$$

$$q = 5(2)^2$$

$$q = 20$$