

2. A monopolist has a demand curve ($P = 100 - Q$) and a total cost curve ($TC = 16 + Q^2$). Find the monopolist's profit maximizing quantity, price and profit.

Step 1

$$TR = 100 - Q^2$$

$$MR = 100 - 2Q$$

$$TC = 16 + Q^2$$

$$MC = 2Q$$

$$MR = 100 - 2Q = 2Q = MC$$

$$100 = 4Q$$

$$Q = 25$$

Step 2

$$P = 100 - Q$$

$$Q = 25$$

$$P = 100 - 25 = 75$$

Price = \$75

Step 3

$$Q = 25 \text{ units}$$

$$TR = 100(Q) - Q^2 = \$1875$$

$$TC = 16 + Q^2 = \$641$$

$$TR - TC = \$1,234$$

Quantity = 25 units

Economic profit = \$1,234

Extra:

At what output does the minimum cost per unit (AC) occur?

Q = 4 units

What would the cost per unit be?

AC = \$8

3. What happens if the monopolist in question 2 finds that their fixed costs have doubled in a new time-period? Find the monopolist's profit maximizing quantity, price and profit.

Total cost would be: $TC = 32 + Q^2$

MC is unchanged

Price ($P = \$75$) and output ($Q = 25$) are unchanged,

Profits drop by the increase in FC to \$1218

Price = \$75

Quantity = 25 units

Economic profit = \$1218

4. Now suppose the monopolist in problem 2 has a total cost curve ($TC = 16 + 4Q^2$). Find the monopolist's profit maximizing quantity, price and profit.

MC is now: $MC = 8Q$

$$MC = MR$$

$$8Q = 100 - 2Q$$

$$Q = 10$$

$$P = 100 - 10 = 90$$

Price = \$90

Quantity = 10 units

$$TR = PQ = \$900$$

$$TC = 16 + 4(10)^2 = \$416$$

$$\pi = \$484$$

Economic profit = \$484

8. The demand by senior citizens (me) for movies at the local theatre has a constant price elasticity of -4 . The demand for all other patrons (you) has a constant price elasticity of demand equal to -2 . The marginal cost per patron is $\$1$, how much should the theatre charge each group?

$$MR = P \left(1 - \frac{1}{|E_p|} \right)$$

$$MC = 1$$

$$\text{Seniors: } MR = P \left(1 - \frac{1}{|-4|} \right) = 1 = MC$$

$$P(.75) = 1$$

$$P_{\text{seniors}} = \$1.33$$

$$\text{Price for seniors} = \underline{\$1.33}$$

$$\text{All others: } MR = P \left(1 - \frac{1}{|-2|} \right) = 1 = MC$$

$$P(.5) = 1$$

$$P_{\text{others}} = \$2$$

$$\text{Price to others} = \underline{\$2.00}$$

During the Iran-Iraq War, you were a monopolist who produced Exocets sold missiles to both sides. Production is subject to constant returns to scale and the $MC = \$200$. Iraq's demand for missiles is $P = 400 - .5Q$, Iran's is $P = 300 - Q$. Price is given in millions of dollars.

Iraq:

$$P = 400 - .5Q$$

$$TR = 400Q - .5Q^2$$

$$MR = 400 - Q$$

$$MC = 200$$

$$MR = 400 - Q = 200 = MC$$

$$Q = 200$$

$$\text{by substitution, } P = \$300$$

What price would you have charged each country to maximize your profits?

$$\text{Price to Iran, } P_{\text{iran}} = \underline{\$250}$$

$$\text{Units sold to Iran} = \underline{50 \text{ Units}}$$

Iran:

$$P = 300 - Q$$

$$TR = 300Q - Q^2$$

$$MR = 300 - 2Q$$

$$MC = 200$$

$$MR = 300 - 2Q = 200 = MC$$

$$Q = 50$$

$$\text{by substitution, } P = \$250$$

$$\text{Price to Iraq, } P_{\text{iraq}} = \underline{\$300}$$

$$\text{Units sold to Iraq} = \underline{200 \text{ units}}$$

Given the Iraq and Iran's demand for missiles above what would be the quantities sold to the two countries and the prices if there were decreasing returns to scale and the TC were $(TC = 100 + .5Q^2)$?

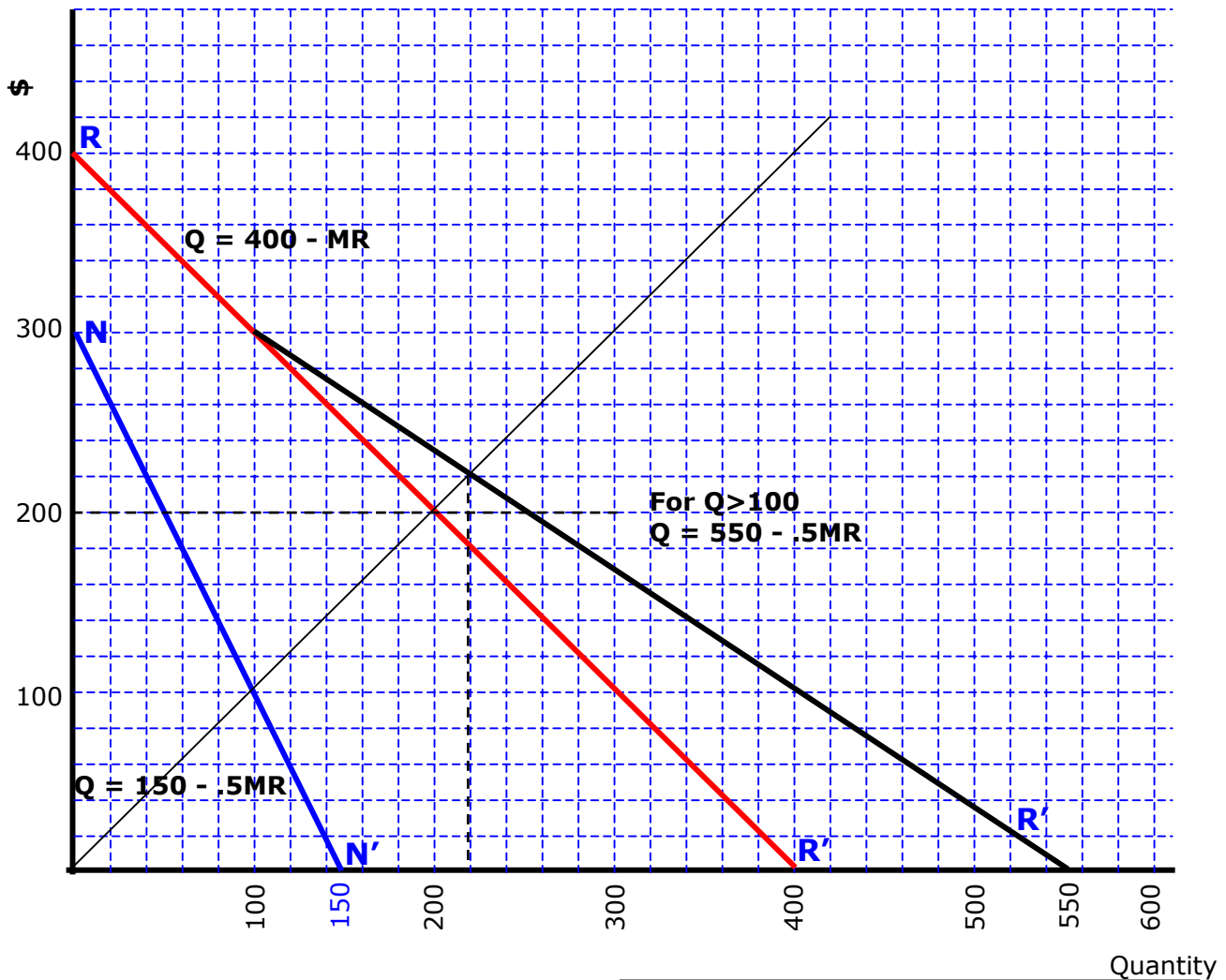
$$MC = Q$$

$$\text{Price to Iran, } P_{\text{iran}} = \underline{\$260}$$

$$\text{Units sold to Iran} = \underline{40 \text{ units}}$$

$$\text{Price to Iraq, } P_{\text{iraq}} = \underline{\$310}$$

$$\text{Units sold to Iraq} = \underline{180 \text{ units}}$$



Iran	Iraq
$P = 300 - Q$	$P = 400 - .5Q$
$TR = 300Q - Q^2$	$TR = 400Q - .5Q^2$
$MR = 300 - 2Q$	$MR = 400 - Q$
so,	so,
$Q = 150 - .5MR$	$Q = 400 - MR$

For $Q > 100$

$$Q = 550 - 1.5MR$$

So,

$$MR = 366.66666667 - .666666667Q$$

To Maximize π , $MC = MR$

$$MC = Q = 366.67 - .67Q = MR$$

$$Q = 366.67 - .67Q$$

$$1.67Q = 366.67$$

$$Q = 220$$

Produce 220 missiles

Given: $MC = Q$

$Q = 220$

To maximize π , $MR = MC = 220$

For Iran

$$Q = 150 - .5MR = 150 - .5(220) = 40$$

Sell 40 missiles to Iran

Iran's Demand for Missiles is $P = 300 - Q$, so the price to Iran is \$260

For Iraq

$$Q = 400 - MR = 400 - 220 = 180 \text{ missiles}$$

Sell 180 missiles to Iraq

Iraq's demand for missiles is $P = 400 - .5Q = 400 - .5(180) = \310

Price to Iraq is \$310