Chapter 2
Pg. 56

(2) $R = 170Q - 20Q^2$

Derive MR:

MR = 1st derivative

$$\frac{dMR}{dQ} = 170 - 40Q$$

Find output where R is maximized:

Total revenue is maximized where marginal revenue = ϕ

$$170 - 40Q = \phi$$
$$170 = 40Q$$
$$4.25 = Q$$

Profit max $Q = 3.3$, where $MR = 38 = MC$

At 4.25, $MR < MC$, so profit is decreasing.

Chapter 2
pg. 56

4) $P = 120 - .5Q$

$C = 420 + 60Q + Q^2$

a) Find firms optimal Q, P, and π

1. Using profit and MR equations:

$\pi = \underset{(P\cdot Q)}{\text{Revenue}} - \text{Cost}$

$= (120 - .5Q)Q - (420 + 60Q + Q^2)$

$= (120Q - .5Q^2) - (420 + 60Q + Q^2)$

$\pi = -420 + 60Q - 1.5Q^2$

$M\pi = \frac{d\pi}{dQ} = 60 - 3Q$ (1st derivative)

Profit is maximized where $M\pi = \phi$

$60 - 3Q = \phi$

$60 = 3Q$

$\boxed{20 = Q^*}$

$P = 120 - .5Q$

$= 120 - .5(20)$

$\boxed{P^* = 110}$

$\pi = -420 + 60(20) - 1.5(20^2)$

$= -420 + 1200 - 600$

$\boxed{\pi^* = 180}$

Chapter 2
pg 56

4 b) $P = 120$

$TR = 120Q$
$MR = 120$

$C = 420 + 60Q + Q^2$
$MC = 60 + 2Q$

$60 + 2Q = 120$

$2Q = 60$
$\boxed{Q^* = 30}$

(cont)

4

2. Setting $MR = MC$

$$TR = P \cdot Q$$
$$= (120 - .5Q)Q$$
$$= 120Q - .5Q^2$$

$$MR = \frac{dR}{dQ} = 120 - Q$$

$$C = 420 + 60Q + Q^2$$

$$MC = 60 + 2Q$$

Set $MC = MR$:

$$60 + 2Q = 120 - Q$$
$$3Q = 60$$
$$\boxed{Q^* = 20} \qquad \boxed{P^* = 110}$$

$$TR = 110 \times 20$$
$$= 2200$$

$$TC = 420 + 60(20) + 20^2$$
$$= 420 + 1200 + 400$$
$$= 2020$$

$$\pi = TR - TC = 2200 - 2020 = \boxed{180}$$

Chapter 2
pg 56

(6) Supplier A

Fixed costs = \$1200
Variable costs = \$2 / cassette

Supplier B

Fixed costs = ϕ
Variable costs = \$4/cass

$Q = 1600 - 200p$
$p = 8 - Q/200$

a) Station plans to give away videos. How many should they order? From whom?

At $P = \phi$,

Demand = $Q = 1600$

Supplier A

$C = 1200 + 2(1600)$

$= 1200 + 3{,}200$

$= \$4{,}400$

Supplier B

$C = 4(1600)$

$= \$6{,}400$

Cheaper option at $p = \phi$

Chapter 2
pg 56

(6) b) Station seeks to maximize profit. What price should it charge? How many should they order?

Supplier A

$P = 8 - Q/200$

$C = 1200 + 2Q$

$TR = (8 - Q/200)Q$

$= 8Q - \frac{1}{200}Q^2$

$MR = 8 - \frac{1}{100}Q$

$TC = 1200 + 2Q$

$MC = 2$

$MR = MC$

$8 - \frac{1}{100}Q = 2$

$6 = Q/100$

$600 = Q^*$

$P = 8 - \frac{600}{200}$

$P = \$5$

$\pi = (600 \cdot 5) - [1200 + 2(600)]$

$= 3000 - 1200 - 1200$

$\pi = \$600$

Supplier B

$P = 8 - Q/200$

$C = 4Q$

$MR = 8 - \frac{1}{100}Q$

$TC = 4Q$

$MC = 4$

$MR = MC$

$8 - \frac{1}{100}Q = 4$

$4 = \frac{1}{100}Q$

$400 = Q^*$

$P = 8 - \frac{400}{200}$

$P^* = \$6$

$\pi = (400 \cdot 6) - (4 \cdot 400)$

$= 2400 - 1600$

$\boxed{\pi = \$800}$

Should order 400 videos at \$6/ea. from B

Chapter 2
pg 58

(11) $Q = 8.5 - .05P$

$C = 100 + 38Q$

- Firm makes price its primary decision -

$\pi = [P(8.5 - .05P)] - [100 + 38(8.5 - .05P)]$

$\pi = 8.5P - .05P^2 - 100 - 323 + 1.9P$

$= -423 + 10.4P - .05P^2$

$M\pi = \frac{d\pi}{dP} = 10.4 - .1P$

Set to ϕ for optimal price:

$10.4 - .1P = \phi$

$\boxed{104 = P^*}$ (in thousands = 104k)

Confirm profit max price on page 35 of book -

$P = 170 - 20(Q)$
$= 170 - 20(3.3)$
$= 170 - 66$
$= 104(,000)$