

* EXAMPLE 8.4

Page (375).

Let t = Number of tons per season

SP = Selling price in order to sell t tons.

$$SP = R = SR(800 - 0.8t)$$

$TR(t)$ = Total revenue when t tons are sold at a particular selling price
= Selling price * demand (production volume).

$TC(t)$ = The total Cost for t tons.
= $SR(10,000 + 400t)$.

1) Find max revenue ?

$$TR(t) = R(t) * t$$

$$TR(t) = (800 - 0.8t) * t$$

$$\therefore TR(t) = 800t - 0.8t^2$$

To find max revenue $\Rightarrow \frac{dTR(t)}{dt} = 0 \Rightarrow t_{max}$

$$\frac{dTR(t)}{dt} = 800 - 1.6t = 0 \quad \therefore t = 500 \text{ tons.}$$

\therefore Max revenue \Rightarrow at $t = 500$ tons

$$TR(500) = 800(500) - 0.8(500)^2 = SR 200,000$$

2) Find total revenue when $TP(t)$ is max ?

First \Rightarrow Find $t_{max} \rightarrow \max TP(t)$.

$$TP(t) = TR(t) - TC(t)$$

$$TP(t) = [(800 - 0.8t)t] - [10,000 + 400t]$$

$$TP(t) = 800t - 0.8t^2 - 10,000 - 400t$$

$$TP(t) = 400t - 0.8t^2 - 10,000$$

$$\frac{dTP(t)}{dt} = 0 \Rightarrow 400 - 1.6t = 0 \Rightarrow t_{max} = 250 \text{ tons.}$$

$$TR(t) = 800t - 0.8t^2$$

$$TR(250) = 800(250) - 0.8(250)^2$$

$$\therefore TR(250) = SR 150,000$$

3) Find max profit ?

$$TP = TR - TC$$

$$TP(t) = 400t - 0.8t^2 - 10,000$$

$\max TP(t) \Rightarrow$ at t_{max}

$$\frac{dTP(t)}{dt} = 0 \Rightarrow 400 - 1.6t \Rightarrow t_{max} = 250 \text{ tons.}$$

$$t = 250 \text{ tons} \rightarrow \max TP(t)$$

Max $TP(t)$ at $t = 250$ tons

$$TP(250) = 400(250) - 0.8(250)^2 - 10,000$$

$$TP(250) = SR 40,000$$

4) Find total profit when TR is max ?

Find $t \rightarrow \text{Max TR}(t)$.

$$\frac{dTR(t)}{dt} = 0 \Rightarrow t$$

$$TR(t) = 800t - 0.8t^2$$

$$\frac{dTR(t)}{dt} = 0 \Rightarrow 800 - 1.6t = 0 \Rightarrow t = 500 \text{ tons}$$

$$\text{at } t = 500 \text{ tons } TP(500) = 400(500) - 0.8(500)^2 - 10,000$$

$$\therefore TP(500) = -\$10,000 \quad \leftarrow 0, \text{ limit}$$

5) Find Average revenue when $t = 500$ tons. ?

$$TR(t) = 800t - 0.8t^2$$

$$ATR(t) = \frac{TR(t)}{t} = \frac{800t - 0.8t^2}{t} = 800 - 0.8t$$

$$ATR(500) = \frac{800(500) - 0.8(500)^2}{500} = 400 \text{ SR}$$

6) Find Marginal revenue when $t = 500$ tons ?

$$TR(t) = 800t - 0.8t^2$$

$$MTR(t) = \frac{dTR(t)}{dt} = 800 - 1.6t$$

$$MTR(500) = 800 - 1.6(500) = \text{SR } 0 \text{ zero.}$$

7) Find range of production of which profit is possible or (Find break even point) ?

To find break-Even point

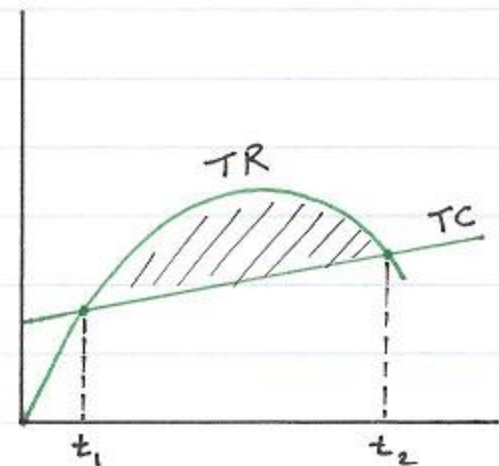
$$TP = 0 \text{ or } TC = TR$$

$$\therefore TC - TR = 0$$

$$10,000 + 400t - 800t + 0.8t^2$$

$$0.8t^2 - 400t + 10,000 = 0$$

$$\text{by } t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



$$26.39 < t < 473.6 \Rightarrow 27 \leq t \leq 473$$