Practice Problems - Ch 3

① $Q = 1{,}000 - 150P + 25I$ $I = \$200$

$= 1{,}000 - 150(10) + 25(200)$ $P = \$10$

$= 1000 - 1500 + 5000$

$Q = 4500$

$\boxed{\begin{array}{l} \varepsilon_p = \underline{-.33} \\ \varepsilon_I = \underline{1.11} \\ \text{Normal} \end{array}}$

$\varepsilon_p = \frac{\partial Q}{\partial P}\left(\frac{P}{Q}\right)$

$= -150\left(\frac{10}{4500}\right)$

$= -.33$

$\varepsilon_I = \frac{\partial Q}{\partial I}\left(\frac{I}{Q}\right)$

$= 25\left(\frac{200}{4500}\right)$

$= 1.11$

__Normal good__ - positive elasticity

- $I\uparrow, Q\uparrow$

② $mc = \$5$

$\varepsilon_p = -4$

$\boxed{\text{Profit Max } P = \underline{6^{67}}}$

$P = mc\left(\frac{\varepsilon_p}{1+\varepsilon_p}\right)$

$= 5\left(\frac{-4}{1+(-4)}\right)$

$= 5(-1.33)$

$= \$6.67$

5 $Q = 10 - 2P$

$= 10 - 2(2.50)$

$Q = 5$

$P = \$2\underline{50}$

$\varepsilon_p = \frac{dQ}{dP}\left(\frac{P}{Q}\right)$

$= -2\left(\frac{2.5}{5}\right)$

$\boxed{= -1}$

$\boxed{\varepsilon_p = \underline{-1} \text{ Unit Elastic}}$

6 $Q = 80 - P^2$

$P = \$4$

$= 80 - 4^2$

$Q = 64$

$\boxed{\varepsilon_p = \underline{-.5}}$

$\varepsilon_p = \frac{dQ}{dP}\left(\frac{P}{Q}\right)$

$= -2P$ (1st der. of Demand Fx)

$= -8\left(\frac{4}{64}\right)$

$\boxed{= -.5}$

(4) $Q = 1{,}000 - P + 40L$ P = machine P

$= 1000 - 400 + 40(10)$ L = long distance call

$Q = 1000$

$P = \$400$

$L = \$10$

<u>Cross Price Elasticity</u>

$\mathcal{E}_L = \frac{\partial Q}{\partial L}\left(\frac{L}{Q}\right)$

$= 40\left(\frac{10}{1000}\right)$

$= .4$ – Substitutes (positive)

$\boxed{\mathcal{E}_L = .4}$ Substitutes

<u>Price Elasticity of Demand</u> $L = \$5$

$\boxed{\mathcal{E}_p = -.5}$

$Q = 1000 - P + 40L$

$= 1000 - 400 + 40(5)$

$Q = 800$

$\mathcal{E}_p = \frac{\partial Q}{\partial P}\left(\frac{P}{Q}\right)$

$= -1\left(\frac{400}{800}\right)$

$= -.5$

(3) $Y_0 = 1980 \qquad Q_0 = 525$

$Y_1 = 2020 \qquad Q_1 = 475$

$$\boxed{\begin{array}{l} \text{Point } \mathcal{E}_I = \underline{-4.75} \\ \text{Arc } \mathcal{E}_I = \underline{-5} \end{array}}$$

Point

$$\mathcal{E}_I = \frac{(Q_1 - Q_0)/Q_0}{(Y_1 - Y_0)/Y_0}$$

$$= \frac{(475-525)/525}{(2020-1980)/1980}$$

$$= \frac{-.095}{.02}$$

$$= -4.75$$

Arc

$$\mathcal{E}_I = \frac{(Q_1 - Q_0)/(Q_1 + Q_2)/2}{(Y_1 - Y_0)/(Y_1 + Y_{00})/2}$$

$$= \frac{(475-525)/500}{(2020-1980)/2000}$$

$$= -5$$

7. $\mathcal{E}_p = -3$
$P = \$3$
$MC = \$2$

Increase, decrease, or keep same price for profit max?

Stay same

$$P = MC\left(\frac{\mathcal{E}_p}{1+\mathcal{E}_p}\right)$$

$$= 2\left(\frac{-3}{1+(-3)}\right)$$

$$\boxed{P = 3 = \text{profit max}-}$$

8. $Q = 100P^{-1.25}A^{0.5}$

P = price
A = advertising

If MC = \$5, what is profit max price?

$$P = MC\left(\frac{\mathcal{E}_p}{1+\mathcal{E}_p}\right)$$

$$= 5\left(\frac{-1.25}{1+(-1.25)}\right)$$

$$= \$25$$

$\mathcal{E}_p$ = -1.25

$\mathcal{E}_A$ = .5

profit max P = \$25

(9) $Q = 100P^{-2}E^{2}$

P = price of costume jewelry

E = price of real jewelry

$\boxed{\begin{array}{l} \varepsilon_P = \underline{\ -2\ } \\ \varepsilon_E = \underline{\ 2\ } \\ \text{Substitutes} \end{array}}$

(10) $P = 600 - Q$ = Demand

$P = \frac{1}{2}Q$ = Supply

(Inverse: $Q = 600 - P$)

$\frac{1}{2}Q = 600 - Q$

$1.5Q = 600$

$Q = 400$

$P = \frac{1}{2}(400)$

$P = 200$

$\varepsilon_P = \frac{dQ}{dP}\left(\frac{P}{Q}\right)$

$= -1\left(\frac{200}{400}\right)$

$\varepsilon_P = -.5$

$\boxed{\varepsilon_P = \underline{\ -.5\ } \text{ at equilibrium}}$