3. Suppose the price elasticity of demand for heating oil is 0.2 in the short run and 0.7 in the long run.

a. If the price of heating oil rises from \$1.80 to \$2.20 per gallon, what happens to the quantity of heating oil demanded in the short run? In the long run? (Use the midpoint method in your calculations.)

b. Why might this elasticity depend on the time horizon?

a) η_D in the short run $= 0.2$, $P_2 = 2.20$

η_D in the long run $= 0.7$, $P_1 = 1.80$

$\Delta P = P_2 - P_1 = 2.20 - 1.80 = 0.40$

Midpoint for $\% \Delta P = \dfrac{P_2 - P_1}{\underbrace{(P_2 + P_1)}_{2.20+1.80=4}/2} = \dfrac{0.4}{\cancel{4}\,2/\cancel{2}} = 0.2 = 20\%$

From $\eta_D = \dfrac{\% \Delta Q_D}{\% \Delta P}$

- In short run ; $\% \Delta Q_D = (\eta_D)(\% \Delta P)$ short run
  $= (0.2)(20\%)$
  $= 4\%$

$\therefore$ The quantity demanded for heating oil in the short run will decrease by 4% ##

- In long run ; $\% \Delta Q_D = (\eta_D)(\% \Delta P)$ long run
  $= (0.7)(20\%)$
  $= 14\%$

$\therefore$ The quantity demanded for heating oil in the long run will decrease by 14% ##

b) Ans : The elasticity of heating oil depends on the time horizon because of the availability of the substitutes that people might prefer at that time ##

7. Suppose that your demand schedule for pizza is as follows:

Price	Quantity Demanded (income = \$20,000)	Quantity Demanded (income = \$24,000)
\$8	40 pizzas	50 pizzas
10	32	45
12	24	30
14	16	20
16	8	12

a. Use the midpoint method to calculate your price elasticity of demand as the price of pizza increases from \$8 to \$10 if (i) your income is \$20,000 and (ii) your income is \$24,000.

b. Calculate your income elasticity of demand as your income increases from \$20,000 to \$24,000 if (i) the price is \$12 and (ii) the price is \$16.

a (i) Income = 20,000 \$

$P_1 = 8$, $Q_{D_1} = 40$

$P_2 = 10$, $Q_{D_2} = 32$

$\Delta P = P_2 - P_1 = 10 - 8 = 2$

$\Delta Q_D = Q_{D_2} - Q_{D_1} = 32 - 40 = -8$

- Midpoint for $\% \Delta P = \dfrac{P_2 - P_1}{(P_2 + P_1)/2} = \dfrac{2}{\cancel{18}^{9}/\cancel{2}} = 0.22 = 22\%$

- Midpoint for $\% \Delta Q_D = \dfrac{Q_{D_2} - Q_{D_1}}{(Q_{D_2} + Q_{D_1})/2} = \dfrac{-8}{\cancel{72}^{36}/\cancel{2}} = -0.22 = -22\%$

By Midpoint Method ; $\boxed{\eta_D = \dfrac{\% \Delta Q_D}{\% \Delta P}}$

$= \dfrac{-\cancel{22\%}}{\cancel{22\%}} = -1$

$\eta_D = -1$ ※

∴ If the income is \$ 20,000 , the price elasticity of demand is -1 ※

(ii) Income = 40,000 \$

$P_1 = 8$, $P_2 = 10$ → $\Delta P = P_2 - P_1 = 2$

$Q_{D_1} = 50$, $Q_{D_2} = 45$ → $\Delta Q_D = Q_{D_2} - Q_{D_1} = 45 - 50 = -5$

- Midpoint for % ΔP = 0.22 = 22%
- Midpoint for % ΔQ_D = $\frac{Q_{D_2} - Q_{D_1}}{(Q_{D_2} + Q_{D_1})/2} = \frac{-5}{\cancel{95}/\cancel{2}\ 47.5} = -0.11 = -11\%$

By Midpoint Method ; $\boxed{\eta_D = \frac{\%\Delta Q_D}{\%\Delta P}}$

$$= \frac{-\cancel{11}\%}{\cancel{22}\%} = -0.5$$

$$\eta_D = -0.5$$

$\therefore$ If the income = 40,000 \$, the price elasticity of demand = -0.5 #

(b) (i) At Price = 12 \$

I	Q_D
20,000	24
24,000	30

Income Elasticity ; $\boxed{\eta_I = \frac{\%\Delta Q_D}{\%\Delta I}}$

$$\%\Delta Q_D = \frac{30 - \cancel{24}}{\cancel{24}\ 4} \times \cancel{100}^{25} = 25\%$$

$$\%\Delta I = \frac{\cancel{24,000 - 20,000}}{\cancel{20,000}\ 5} \times \cancel{100}^{20} = 20\%$$

$$\eta_I = \frac{\%\Delta Q_D}{\%\Delta I} = \frac{\cancel{25}^{5}\cancel{\%}}{\cancel{20}_{4}\cancel{\%}} = 1.25 \ \#$$

$\therefore$ At 12 \$, the income elasticity of demand is 1.25 #

(ii) At Price = 16 \$

I	Q_D
20,000	8
24,000	12

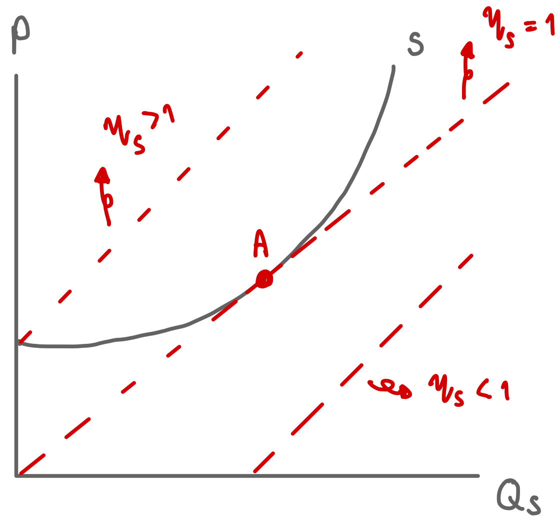
$$\%\Delta Q_D = \frac{\cancel{12-8}}{\cancel{8}\ 2} \times \cancel{100}^{50} = 50\%$$

$$\%\Delta I = 20\%$$

$$\eta_I = \frac{\%\Delta Q_D}{\%\Delta I} = \frac{5\cancel{0}\%}{2\cancel{0}\%} = 2.5 \ \#$$

$\therefore$ At 16\$, the income elasticity of demand is 2.5 #

H.W.



Find the points on S that has

a) $\eta_s > 1$ <u>Ans</u> no point on S that is satisified ※

b) $\eta_s < 1$ <u>Ans</u> no point on S that is satisified ※

c) $\eta_s = 1$ <u>Ans</u> According to graph, At point A, $\eta_s = 1$ ※