Q10

$$F(c; q_A, q_B) = c + \sqrt{c} - 12 - q_A\sqrt{9+q_B^2}$$

$q_A = 6$, $q_B = 4$

$$\Rightarrow \quad c + \sqrt{c} = 12 + 6\sqrt{9+4^2}$$
$$= 12 + 6\sqrt{25}$$
$$= 12 + 6\cdot 5 = 42$$

$$c + \sqrt{c} - 42 = 0$$
$$(\sqrt{c} + 7)(\sqrt{c} - 6)$$

$\sqrt{c} = 6, -7$; $\sqrt{c} = -7$ doesn't make sense.

$c = 36$

$$\frac{\partial c}{\partial q_A} = -\frac{F_A}{F_c} = -\frac{-\sqrt{9+q_B^2}}{1 \cancel{+} - \frac{1}{2\sqrt{c}}}$$

$$= \left.\frac{\sqrt{9+q_B^2}}{1 - \frac{1}{2}\cdot\frac{1}{\sqrt{c}}}\right|_{q_A, q_B = (6,4)}$$

$$= \frac{\sqrt{9+16}}{1 - \frac{1}{2}\cdot\frac{1}{\sqrt{36}}} = \frac{5}{\frac{11}{12}} = \frac{60}{11} \ \#$$

$$\frac{\partial c}{\partial q_B} = -\frac{F_B}{F_c}$$

$$= -\frac{\left[-q_A \cdot \frac{1}{2} \cdot \frac{1}{\sqrt{9+q_B^2}} \cdot 2q_B\right]}{1 - \frac{1}{2} \cdot \frac{1}{\sqrt{c}}}$$

$$= \frac{q_A \cdot \frac{1}{2} \cdot \frac{1}{\sqrt{9+q_B^2}} \cdot 2q_B}{1 - \frac{1}{2} \cdot \frac{1}{\sqrt{c}}}$$

$$= \frac{6 \cdot \frac{1}{2} \cdot \frac{1}{\sqrt{9+16}} \cdot 2(4)}{1 - \frac{1}{12}}$$

$$= \frac{24}{25} \cdot \frac{12}{11} \quad \#$$

Q 13. as the question only need to know the behavioural response of y and r to exogenous, we can simplify the system into 2×2 system. That is

Is equation

$$y = C(Y_d) + I(r) + G_0$$

$$y = C(Y - T_0) + I(r) + G_0 \quad -①$$

LM Equation

$$M_s = M(y, r) \quad -②$$

∴ Perform Total differential on ① and ②.

From ①;

$$dy = C'(\cdot)(dy - dT_0) + I'(r).dr + dG_0$$

$$dy - I'(r).dr = -C'(\cdot)dT_0 + dG_0 \quad -③$$

From ②;

$$dMs = \overset{\frac{\partial M}{\partial r}}{M_r'}(\cdot)dr + \overset{\frac{\partial M}{\partial y}}{M_y'}.dy \quad -④$$

Putting ③ and ④ in Matrix form, we know that

$$\begin{pmatrix} 1 & -I'(r) \\ M_y' & M_r' \end{pmatrix}\begin{pmatrix} dy \\ dr \end{pmatrix} = \begin{pmatrix} -C'(\cdot)\,dT_0 + dG_0 \\ dM_s \end{pmatrix}$$

$$|A| = \overset{\ominus}{M_r'} + \overset{\ominus}{I'(r)} \cdot \overset{\oplus}{M_y'} < 0 \qquad \text{sign:}$$

$$\therefore\; dy = \frac{\begin{vmatrix} -c'\,dT_0 + dG_0 & -I' \\ dM_s & M_r' \end{vmatrix}}{|A|}$$

$M_r' = \dfrac{\partial M}{\partial r}$

$M_y' = \dfrac{\partial M}{\partial y}$

$$= \frac{I'\,dM_s - M_r'\,c'\,dT_0 + M_r\,dG_0}{|A|}$$

$$dr = \frac{\begin{vmatrix} 1 & -c'\cdot dT_0 + dG_0 \\ M_y & dM_s \end{vmatrix}}{|A|}$$

$$= \frac{dM_s + c'\,M_y'\,dT_0 - M_y'\,dG_0}{|A|}$$

$$\frac{\partial y}{\partial M_s} = \frac{I'}{|A|} = \frac{\ominus}{\ominus} > 0$$

$$\frac{\partial y}{\partial dT_0} = \frac{-M_r' \cdot c'}{|A|} = \frac{\ominus \cdot \ominus \cdot \oplus}{\ominus} < 0$$

$$\frac{\partial y}{\partial dG_0} = \frac{M_r'}{|A|} = \frac{\ominus}{\ominus} > 0$$

Do the rest yourself.

Q14

$$\frac{\partial P}{\partial K} = \frac{(K+L)(L) - (KL)}{(K+L)^2}$$

$$= \frac{L^2}{(K+L)^2}$$

$$\frac{\partial P}{\partial L} = \frac{(K+L)(K) - (KL)}{(K+L)^2}$$

$$= \frac{K^2}{(K+L)^2}$$

$\therefore \frac{\partial P}{\partial K} = \frac{\partial P}{\partial L}$ if

$$\frac{L^2}{(K+L)^2} = \frac{K^2}{(K+L)^2}$$

$\Rightarrow L^2 = K^2 \Rightarrow L = K$ Answer.

Question 15

a) $$\frac{\partial q_A}{\partial P_B} = e^{-(P_A+P_B)} \cdot (-1) < 0$$

$\therefore P_B \uparrow \; ; \rightarrow q_A \downarrow$

Since $P_B \uparrow \rightarrow q_B \downarrow$ ~~and~~

$\Rightarrow$ Complemet A, B changes in the same direction

b)

For A:

$$\varepsilon_{A,P_A} = \frac{\partial q_A}{\partial P_A} \cdot \frac{P_A}{q_A} = -e^{(-(P_A+P_B))} \cdot \frac{P_A}{e^{-(P_A+P_B)}}$$

$$= \underline{\underline{-P_A}}$$

$$\varepsilon_{A,P_B} = \frac{\partial q_A}{\partial P_B} \cdot \frac{P_B}{q_A} = -e^{-(P_A+P_B)} \cdot \frac{P_B}{e^{-(P_A+P_B)}}$$

$$= \underline{\underline{-P_B}}$$

For B:

$\varepsilon_{B,P_A} \Rightarrow q_B = 16 \cdot P_A^{-2} P_B^{-2}$

$\ln q_B = \ln 16 - 2\ln P_A - 2\ln P_B$

$$\varepsilon_{B,P_B} = \frac{\partial \ln q_B}{\partial \ln P_B} = \underline{\underline{-2}}^{\#} \; ; \; \varepsilon_{B,P_A} = \frac{\partial \ln q_B}{\partial \ln P_A} = \underline{\underline{-2}}.^{\#}$$

c) $P_A = 1000 \quad ; P_B = 2000$

$$; \quad dq_A = \frac{\partial q_A}{\partial P_A} \cdot dP_A + \frac{\partial q_A}{\partial P_B} \cdot dP_B$$

$$\Rightarrow \quad dq_A = \frac{\partial q_A}{\partial P_B} \cdot dP_B \qquad ; dP_A = 0$$

$$= -e^{-(P_A+P_B)} \cdot dP_B$$

$$; dP_B = -20.$$

$$= -e^{-(3000)} \cdot (-20)$$

$$= e^{-3,000} \text{ units.}$$

c) $P_A = 1000 \quad ; P_B = 2000$

$$; \quad dq_A = \frac{\partial q_A}{\partial P_A} . dP_A + \frac{\partial q_A}{\partial P_B} . dP_B$$

$$\Rightarrow \quad dq_A = \frac{\partial q_A}{\partial P_B} . dP_B \qquad ; dP_A = 0$$

$$= -e^{-(P_A+P_B)} . dP_B \qquad ; dP_B = -20.$$

$$= -e^{-(3000)} . (-20)$$

$$= e^{-3,000} \text{ units.}$$

Question 16

a) I will skip "a". Do the same as (15.a)

b) $$d q_A = \frac{\partial q_A}{\partial p_A} dp_A + \frac{\partial q_A}{\partial p_B} dp_B$$

$$= \frac{-20}{3} \cdot \frac{\sqrt{p_B}}{p_A^{5/3}} dp_A + \frac{\partial q_A}{\partial p_B} \cdot dp_B$$

$$= \frac{-20}{3} \cdot \frac{\sqrt{64}}{(8)^{5/3}} \cdot (60 - 64)$$

Note: you must use initial price!

initial p = 60

$$= \frac{-20}{3} \frac{8}{2^5} (-4)$$

$$= \frac{640}{3 \cdot 32} = \frac{20}{3} \#$$

Question 17

· Repeat Question 16; but the economic function is Cost, rather than demand function.

Question 18

$$\frac{\partial C}{\partial P_A} = \frac{\partial C}{\partial q_A} \cdot \frac{\partial q_A}{\partial P_A}$$

$$\frac{\partial C}{\partial q_A} = \frac{1}{3}\left(3q_A^2 + q_B^3 + 4\right)^{-2/3}(6q_A)$$

$$\frac{\partial q_A}{\partial P_A} = -1$$

$$\therefore \quad \frac{\partial C}{\partial P_A} = \frac{1}{3}\left(3(25)^2 + (4)^3 + 4\right)^{-\frac{2}{3}}(6(25)) \cdot (-1)$$

The other one, just do it yourself.