Spring 2004
Economics

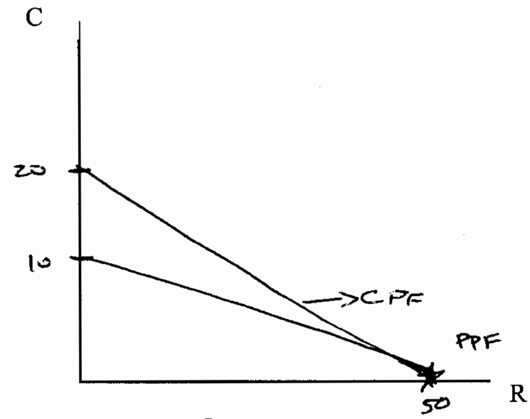
Practice Questions – Economics 101

1. Japan and China each produce rice(R) and computers (C). The PPFs for Japan and China are described by the following equations:

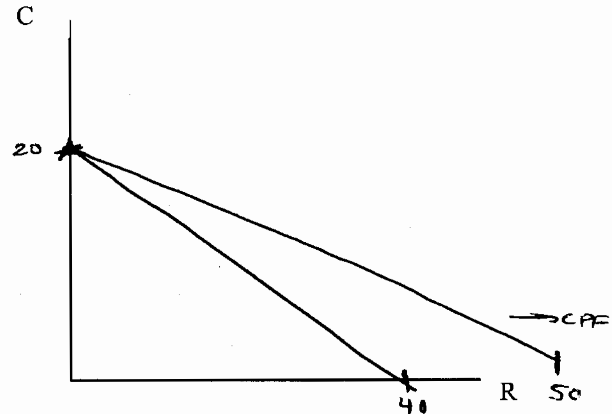
Japan: $C = 10 - \frac{1}{5}R$

China: $C = 20 - \frac{1}{2}R$

a) Graph the PPFs for each country:



Japan



China

Japan has the comparative advantage in the production of rice.
China has the comparative advantage in the production of computers.

b) Do these countries have an incentive to trade? Will both countries accept a trade rate of 5 rice for 2 computers? Why or why not? Be specific.

Japan → Yes Normally to get 2C give up 10R.

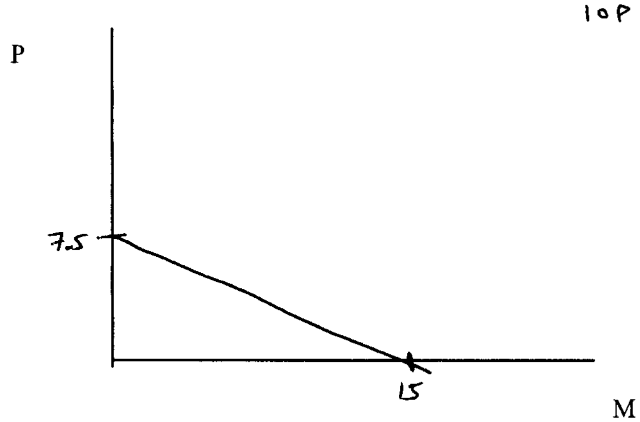
China → Yes Normally 2C gets only 4R.

c) On the same graphs that you used for part a, draw/label the consumption possibility frontier (CPF) for each country. You should do this even if you found that the countries would not trade with one another.

2. Sam has \$75 to spend on two goods – Pizza and Movies. Pizzas are \$10 each, and movie tickets are \$5.

a) Write down the equation for Sam's budget constraint. On the axes below, graph her budget constraint.

$10P + 5M = 75$



b) If Sam receive marginal utility from the goods according to the following functions,

$$MU_p = 20 - P$$
$$MU_m = 30 - 3M$$

then is the bundle (15 movies, 5 pizzas) her utility maximizing bundle? Why or why not?

$\hookrightarrow$ No can't afford it.

Otherwise: $\boxed{\dfrac{MU_P}{P_P} = \dfrac{MU_M}{P_M}}$

c) If Sam's income increases to \$200, then what how many pizzas and movies will be in her optimal bundle?

$$\boxed{\frac{20 - P}{10} = \frac{30 - 3M}{5}}$$

$100 - 5P = 300 - 30M$

① $\boxed{30M - 5P = 200}$

② $\boxed{5M + 10P = 200}$

$M = 40 - 2P$

① → ② $30(40 - 2P) - 5P = 200$

$1200 - 60P - 5P = 200$

$1000 = 65P$

$\boxed{\begin{array}{l} P^* = 15.4 \\ M^* = 9.2 \end{array}}$

3. The following equations describe the supply and demand for apartments in Statesville.

Demand: $Q = 500 - \frac{1}{4}P$

Supply: $Q = -400 + 2P$

a) Find the equilibrium price and quantity in the apartment market in Statesville.

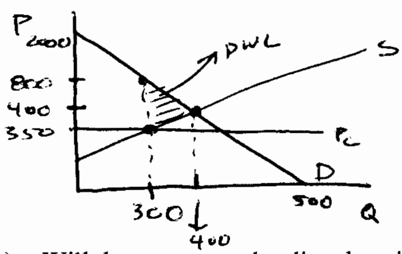
$$500 - \frac{1}{4}P = -400 + 2P$$

$$2000 - P = -1600 + 8P$$

$$3600 = 9P$$

$$\boxed{P^* = 400 \qquad Q^* = 400}$$

b) If the city council in Statesville imposes a rent control ordinance of \$350 per apartment, then how many apartments will be rented in Statesville?



$Q_s = 300$

c) Will the rent control policy described in part b) result in an allocation of apartments that is economically efficient? Why or why not? Use a graph to help support your answer.

No, generates DWL.

DWL = 

d) Use the equilibrium you calculated in part a), as well as the point P = 200 Q = 450, and calculate the price elasticity of demand at the equilibrium.

Actually, use calculus!

$$\varepsilon_d = \left| \frac{dQ}{dP} \cdot \frac{P}{Q} \right| = \left| -\frac{1}{4} \cdot \frac{400}{400} \right| = \frac{1}{4}$$

4. Hurley, Wisconsin is a small town on the Wisconsin-Michigan border. It is cold and snowy in Hurley, so the residents of Hurley like to watch a lot of movies. The market demand for movie rentals in Hurley is given by the following equation:

$$Q = 800 - 100P$$

The cost structure for movie rental firms is well known, and it is given by the following equations:

$$TC = 50 + \frac{Q^2}{50} \qquad MC = \frac{Q}{25}$$

Assume that the market for movie rentals in Hurley is **perfectly competitive**. Furthermore, assume that there are **currently four firms** in this industry.

a) Write down the firms' expressions for ATC and AVC.

$$ATC = \frac{50}{Q} + \frac{Q}{50} \qquad AVC = \frac{Q}{50}$$

b) Write down the equation for each firm's short run supply function.

$$MC = \frac{Q}{25} \Rightarrow P = \frac{Q}{25} \Rightarrow Q = 25P$$

c) Write down the equation for the short run market supply.

$$Q_M = Q_1 + Q_2 + Q_3 + Q_4 \Rightarrow Q_M = 100P$$

d) What is the short run market equilibrium price in this market? How many movies are being rented in Hurley? Is each firm earning positive economic profit in the short run? How do you know this? (Hint: You do not need to calculate the amount of profit!)

$$Q_M^S = Q_M^D \Rightarrow 100P = 800 - 100P$$

$$\boxed{P^* = 4 \quad Q_M^* = 400}$$

$$P^* = 4$$

$$ATC^* = \frac{50}{100} + \frac{100}{50}$$

$$ATC^* = 2.50 \qquad P^* > ATC \Rightarrow \text{Econ. } \pi!$$

e) What is the long run equilibrium price in this market? How many movie rental firms will there be in Hurley in the long run? (You **must** show your work!)

$MC = ATC \rightarrow$ Long run price.

$$\frac{Q}{25} = \frac{50}{Q} + \frac{Q}{50}$$

$$2Q^2 = Q^2 + 50^2$$

$$Q_f = 50 \qquad MC = ATC = P^*_{LR} = \$2$$

$$Q_M = 600 \qquad \frac{600}{50} = 12$$

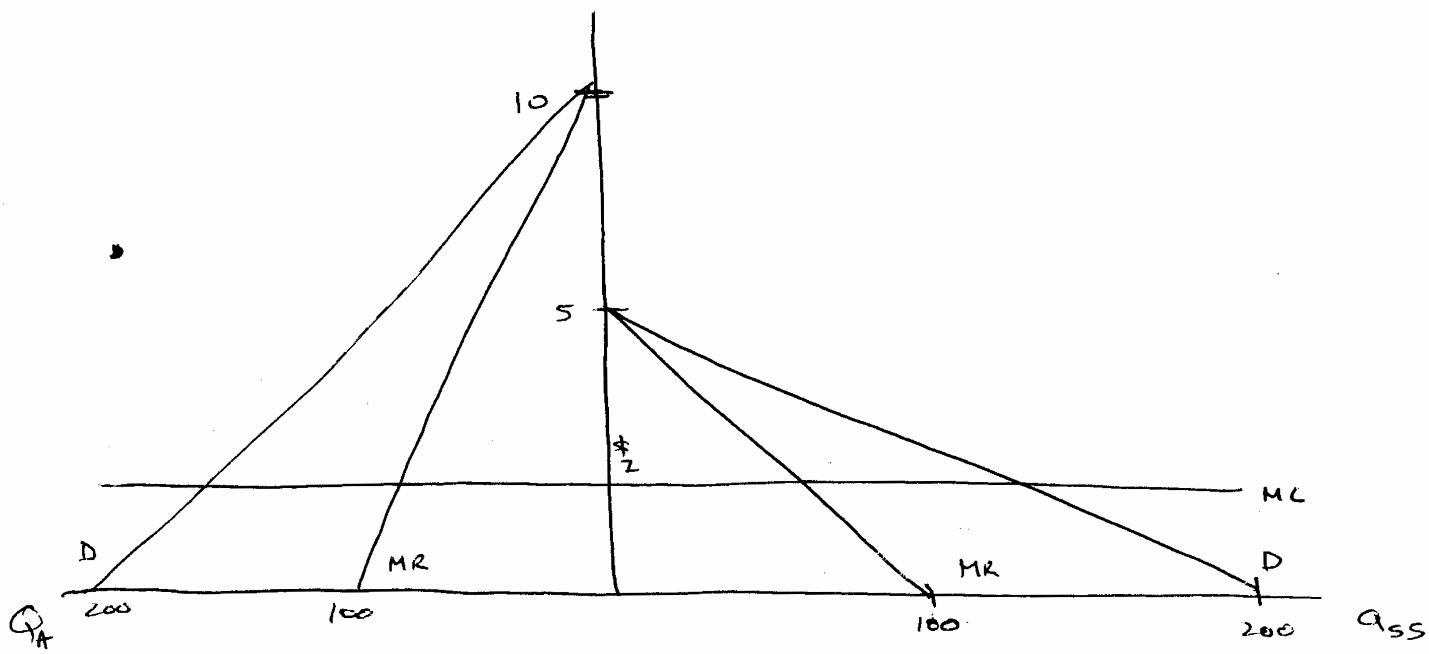
12 firms in the LR!

5. Colossal Theater, a local monopolist in the town of Yellowknife, recognizes that senior citizens are very price sensitive. Therefore, Colossal has paid a local consulting firm a large consulting fee to estimate the demand functions for movie tickets for senior citizens as well as for non-senior adults. The consulting firm found that the demand functions are as follows:

Adults: $Q = 200 - 20P$ $\quad P = 10 - \frac{1}{20}Q \quad MR = 10 - \frac{1}{10}Q$

Senior Citizens: $Q = 200 - 40P$ $\quad P = 5 - \frac{1}{40}Q \quad MR = 5 - \frac{1}{20}Q$

If the marginal cost of a movie ticket is $2, then what price should Colossal charge for an adult ticket? What price should Colossal charge for a senior citizen ticket?



Adults:

$MR = MC \Rightarrow$

$$10 - \frac{1}{10}Q = 2$$

$$8 = \frac{1}{10}Q$$

$$\boxed{Q^* = 80 \qquad P^* = 6}$$

Seniors:

$$5 - \frac{1}{20}Q = 2$$

$$\boxed{\begin{array}{l} Q^* = 60 \\ P^* = 3.50 \end{array}}$$

5.

$$\text{Max} \quad U = x_1 x_2 + x_1 \quad \text{s.t.} \quad P_1 x_1 + P_2 x_2 = I$$

$$\mathcal{L} = x_1 \cdot x_2 + x_1 - \lambda (P_1 x_1 + P_2 x_2 - I)$$

$$\mathcal{L}_{x_1} \Rightarrow x_2 + 1 - \lambda P_1 = 0$$

$$\boxed{\frac{x_2+1}{P_1} = \lambda = \frac{x_1}{P_2}}$$

$$\mathcal{L}_{x_2} \Rightarrow x_1 - \lambda P_2 = 0$$

$$\frac{x_2+1}{P_1} = \frac{x_1}{P_2}$$

$$\mathcal{L}_{\lambda} \Rightarrow -(P_1 x_1 + P_2 x_2 - I) = 0$$

① $$\boxed{x_1 = \frac{(x_2+1) P_2}{P_1}}$$

② $$\boxed{P_1 x_1 + P_2 x_2 = I}$$

Plug ① → ②

$$P_1 \left(\frac{(x_2+1) P_2}{P_1} \right) + P_2 x_2 = I$$

$$P_2 x_2 + P_2 + P_2 x_2 = I$$

$$2P_2 x_2 = I - P_2$$

$$\boxed{x_2 = \frac{1}{2} \cdot \frac{I}{P_2} - \frac{1}{2}}$$

Plus ① → ②

$$P_1 x_1 + P_2 \left(\frac{P_1}{P_2} x_1 - 1 \right) = I$$

$$2 P_1 x_1 + P_2 = I \Rightarrow \boxed{x_1 = \frac{1}{2} \cdot \frac{I}{P_1} - \frac{P_2}{2P_1}}$$

10. $x_1 = \frac{1}{2} \cdot \frac{I}{P_1}$ $\qquad$ $x_2 = \frac{1}{2} \cdot \frac{I}{P_2}$

Slutsky => $\frac{dx_1}{dP_1} = \frac{dx_1^c}{dP_1} - x_1 \frac{dx_1}{dI}$

Total Effect

$$\boxed{\frac{dx_1}{dP_1} = -\frac{1}{2} \cdot \frac{I}{P_1^2} = -12.5}$$

$$\frac{dx_1}{dI} = \frac{1}{2} \cdot \frac{1}{P_1} = \frac{1}{4}$$

$$x_1 = \frac{1}{2} \cdot \frac{I}{P_1} = 25$$

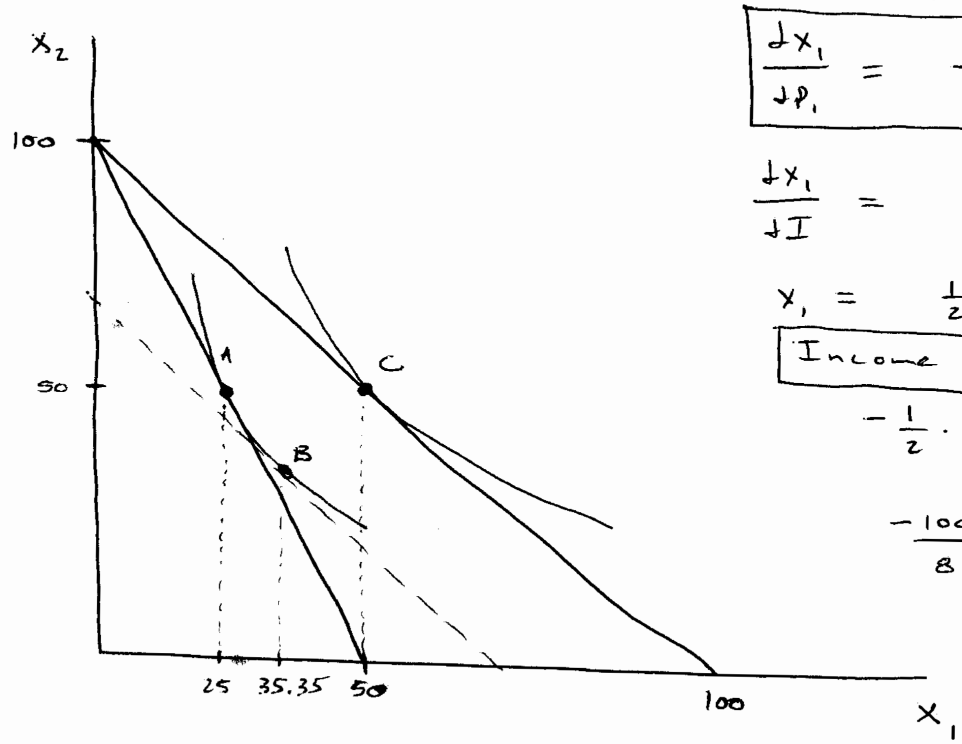
$\boxed{\text{Income Effect} = -6.25}$

$$-\frac{1}{2} \cdot \frac{100}{2^2} = \frac{100}{8}$$

$$-\frac{100}{8} = \boxed{S} - 25 \cdot \frac{1}{4}$$

$$-\frac{100}{8} + \frac{50}{8} = S$$

$$\boxed{S = -6.25}$$



x_1^A => $x_1 = \frac{1}{2} \cdot \frac{100}{2} = 25$

$x_2 = \frac{1}{2} \cdot \frac{100}{1} = 50$

x_1^C => $x_1 = 50$

$x_2 = 50$

x_1^B => $x_1 = 35.35$

$x_2 = 35.35$

$(I = 70.70)$

B? Need to set-up

$$\mathcal{L} = x_1 + x_2 - \lambda(x_1 \cdot x_2 - 1250)$$

$$\mathcal{L}_{x_1} = 1 - x_2\lambda = 0$$

$$\mathcal{L}_{x_2} = 1 - x_1\lambda = 0$$

$$\mathcal{L}_{\lambda} = -(x_1 \cdot x_2 - 1250) = 0$$

$$\frac{1}{x_1} = \lambda = \frac{1}{x_2}$$

1 $\boxed{x_2 = x_1}$

2 $\boxed{x_1 \cdot x_2 = 1250}$

$$x_1^2 = 1250$$

$$\boxed{\begin{aligned} x_1 &= 35.35 \\ x_2 &= 35.35 \end{aligned}}$$

Cost

10. $Q = K^{1/3} L^{1/3}$

$$\mathcal{L} = w \cdot L + r \cdot K - \lambda \left(K^{1/3} L^{1/3} - Q \right)$$

$$\mathcal{L}_L \Rightarrow w - \tfrac{1}{3} \cdot \lambda K^{1/3} L^{-2/3} = 0$$

$$\mathcal{L}_K \Rightarrow r - \tfrac{1}{3} \cdot \lambda K^{-2/3} L^{1/3} = 0$$

$$\mathcal{L}_\lambda \Rightarrow -\left(K^{1/3} L^{1/3} - Q \right) = 0$$

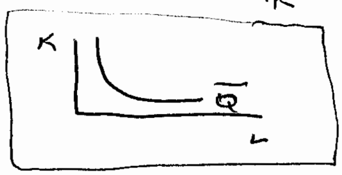
$$\frac{3w}{K^{1/3} L^{-2/3}} = \frac{3r}{K^{-2/3} L^{1/3}}$$

① $\boxed{\dfrac{K}{L} = \dfrac{w}{r}}$

$$MRTS = \frac{P_L}{P_K}$$

goal: CFDs

② $\boxed{K^{1/3} L^{1/3} = Q}$



$$K = L \cdot \frac{w}{r}$$

① → ②

$$\left(L \frac{w}{r} \right)^{1/3} L^{1/3} = Q$$

$$L^{2/3} = Q \cdot \left(\frac{r}{w} \right)^{1/3}$$

$$\boxed{L^{*} = Q^{3/2} \cdot (r/w)^{1/2}}$$

$$L = \frac{r}{w} \cdot K$$

① → ②

$$K^{1/3} \cdot \left(\frac{r}{w} K \right)^{1/3} = Q$$

$$K^{2/3} = Q \cdot \left(\frac{w}{r} \right)^{1/3}$$

$$\boxed{K = Q^{3/2} \cdot \left(\frac{w}{r} \right)^{1/2}}$$

$$C(w, r, Q) = w \cdot L^{*} + r \cdot K^{*}$$

$$C = w^{1/2} r^{1/2} \cdot Q^{3/2} + w^{1/2} \cdot r^{1/2} \cdot Q^{3/2}$$

$$\boxed{C = 2 w^{1/2} r^{1/2} Q^{3/2}}$$