Homework 2

#3) $X_c(P_c, m) = \frac{m}{2P_c}$

a) $m = 20$, $P_c = 2$, X_c?
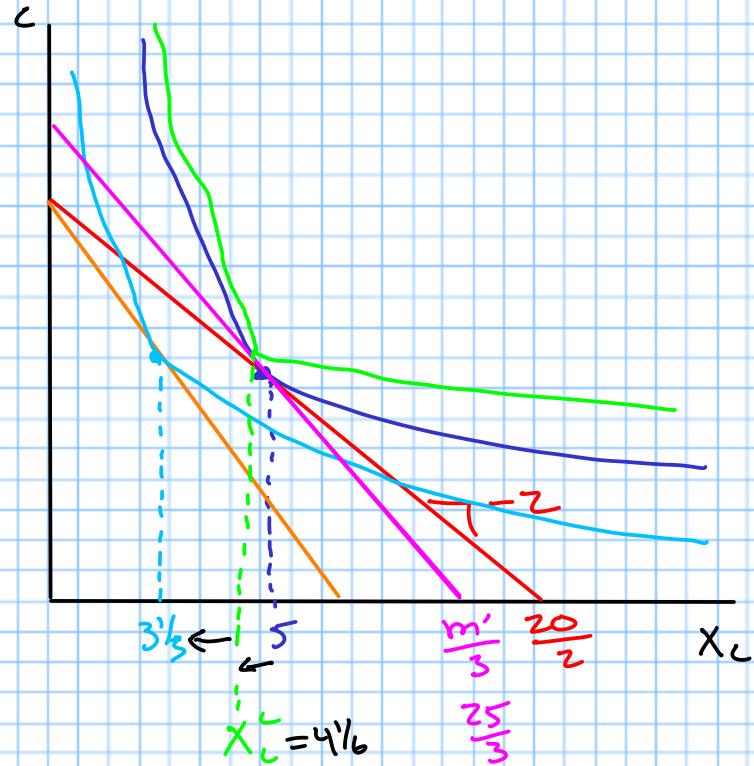
$X_c(2, 20) = \frac{20}{2 \cdot 2} = 5$

b) $P_c' = 3$ $X_c(3, 20) = \frac{20}{2 \cdot 3} = 3\frac{1}{3}$

c) find m' after the price change

$\Delta m = X_c \Delta P_c$

$= 5 \cdot (3 - 2)$

$= 5$

$m' = 25$

c

-2

$3\frac{1}{3} \leftarrow \quad 5 \qquad \frac{m'}{3} \quad \frac{20}{2} \qquad X_c$

$X_c = 4\frac{1}{6}$

$\frac{25}{3}$

d) $x_c^c = x_c(3, 25) = \dfrac{25}{2 \cdot 3}$

$$= 4\,\text{V}_6$$

e) $\Delta x_c^s = x_c^c - x_c$

$$= -5/6$$

$\Delta x_c^m = x_c' - x_c^c$

$$= 3\text{V}_3 - 4\text{V}_6$$

$$= \dfrac{10}{3} - \dfrac{25}{6}$$

$$= -\dfrac{5}{6}$$

f) Normal (income effect negative)

#i) Engel curve for an inferior good (graphically)

x_2

$\dfrac{m}{P_1}$ $\dfrac{m'}{P_1}$ x_1

m

m'

m

Engel curve

x_1' x_1
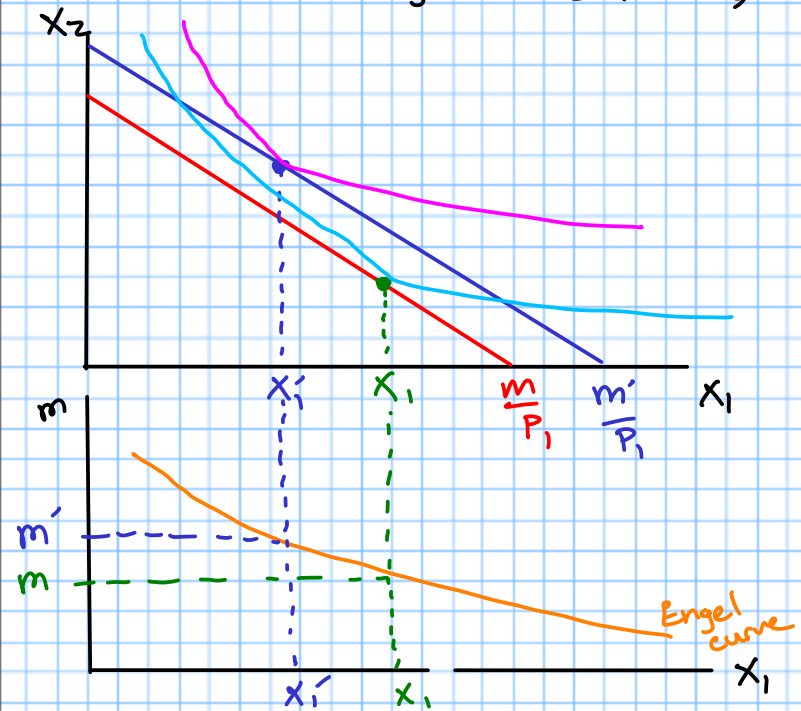
#2) $u(x_1, x_2) = x_1^5 x_2^2$

$P_1 = 8$ $P_2 = 2$ $m = 30$

a) $MRS = \dfrac{5x_2}{2x_1}$

b) $8x_1 + 2x_2 = 30$

c) ① $MRS = \dfrac{P_1}{P_2}$

   ② $8x_1 + 2x_2 = 30$

   $\dfrac{5x_2}{2x_1} = 4$

   $5x_2 = 8x_1$

   $x_2 = \dfrac{8}{5}x_1$

   $8x_1 + 2\left(\dfrac{8}{5}x_1\right) = 30$

$8x_1 + \dfrac{16}{5}x_1 = 30$

$\dfrac{56}{5}x_1 = 30$

$56x_1 = 150$

$x_1 = \dfrac{150}{56}$

$\to x_2 = \dfrac{8}{5}x_1$

$= \dfrac{8}{5} \cdot \dfrac{150}{56}$

$= \dfrac{150}{35}$

d) ① $\dfrac{5x_2}{2x_1} = \dfrac{P_1}{2}$

② $P_1 x_1 + 2x_2 = 30$

$10x_2 = 2P_1 x_1$

$x_2 = \dfrac{2P_1 x_1}{10}$

$P_1 x_1 + 2 \cdot \dfrac{2P_1 x_1}{10} = 30$

$P_1 x_1 + \dfrac{2}{5} P_1 x_1 = 30$

$6P_1 x_1 = 150$

$x_1 = \dfrac{150}{P_1 7}$

e) $x_1 = x_1(m)$

① $\dfrac{5x_2}{2x_1} = \dfrac{8}{2}$

② $8x_1 + 2x_2 = m$

$\cdots$ $x_1 = \dfrac{5m}{56}$

f) Is x_1 a Giffen good?

No. as P_1 increases,

$\dfrac{150}{P_1 7}$ decreases

g) Normal or interior?

Normal. as m increases

$\dfrac{5m}{56}$ increases

#4) $f(K,L) = K L^{1/2}$

$\overline{K} = 8$ $w = 8$ $r = 10, p = 2$

a) Find L^* (short run Π-max)

$P MPL = w$

$MPL = \frac{1}{2} K L^{-1/2}$

$2 \left(\frac{1}{2} \cdot 8 \cdot L^{-1/2} \right) = 8$

$L^{-1/2} = 1$

$\frac{1}{L^{1/2}} = 1$

$L^{1/2} = 1$

$L = 1^2$

$L = 1$

b) $y = 8 \cdot 1^{1/2}$

$= 8$

c) $\Pi = p \cdot y - (r K + w L)$

$= 2 \cdot 8 - (10 \cdot 8 + 8 \cdot 1)$

$= 16 - (80 + 8)$

$= 16 - 88$

$= -72$

d) What is the firm's long run level of capital and labor?

→ Increasing RTS in long run means there is no finite L^*, K^*