Lab 3 _ Answers for ECON-2101-001

MD

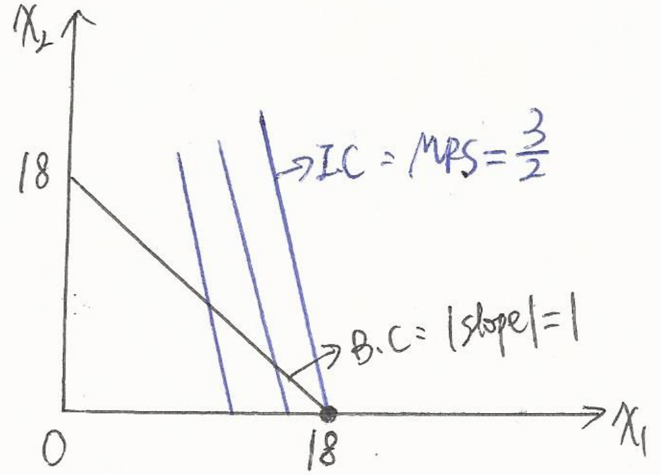
1\. a). $U = 3X_1 + 2X_2$, $M = 72$, $P_1 = P_2 = 4$

$\Rightarrow MRS = \frac{3}{2}$

$\max X_1 = \frac{72}{4} = 18$

$\max X_2 = \frac{72}{4} = 18$

$\frac{3}{2} = MRS > \frac{P_1}{P_2} = 1$



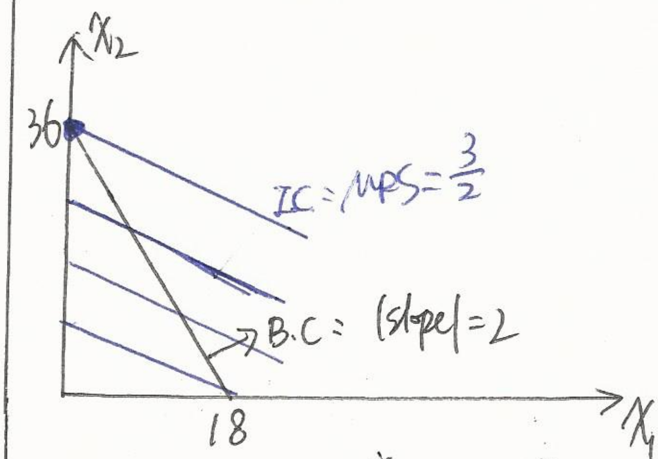
$\Rightarrow$ Buy just $X_1^* = 18$, $X_2^* = 0$

$M = 72$, $P_1 = 4$, $P_2 = 2$

$\max X_1 = \frac{72}{4} = 18$

$\max X_2 = \frac{72}{2} = 36$

$MRS = \frac{3}{2} < \frac{P_1}{P_2} = 2$



$\Rightarrow$ Buy just $X_2^* = 36$, $X_1^* = 0$

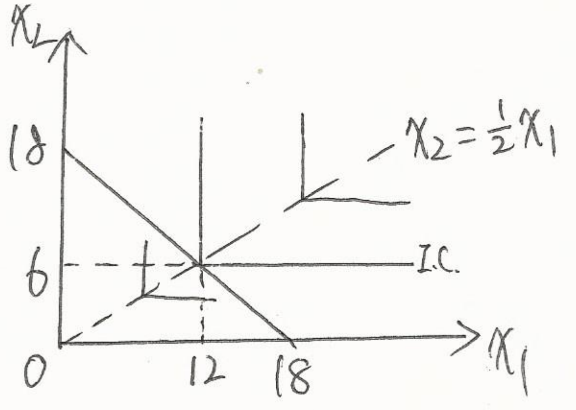
b). Set $2X_1 = 4X_2 \Rightarrow X_1 = 2X_2$

B.C: $72 = 4X_1 + 4X_2$ $(P_1 = P_2 = 4)$

$\Rightarrow 72 = 8X_2 + 4X_2$

$72 = 12X_2$

$X_2^* = 6$, then $X_1^* = 2X_2^* = 12$



when $P_2 = 2$,

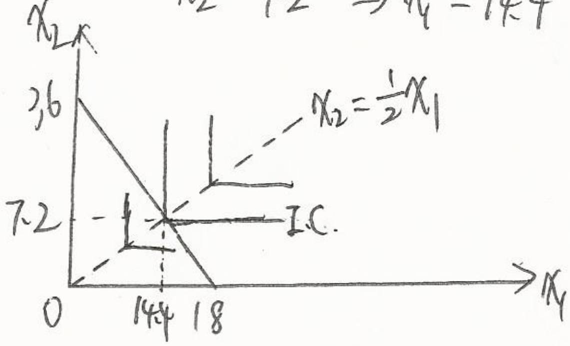
B.C: $72 = 4X_1 + 2X_2$

Substitute $X_1 = 2X_2$ into B.C:

$72 = 8X_2 + 2X_2$

$72 = 10X_2$

$X_2^* = 7.2 \Rightarrow X_1^* = 14.4$



C. $M=72$, $P_1=P_2=4$

B.C: $72=4x_1+4x_2$

set $MRS=\frac{P_1}{P_2}$

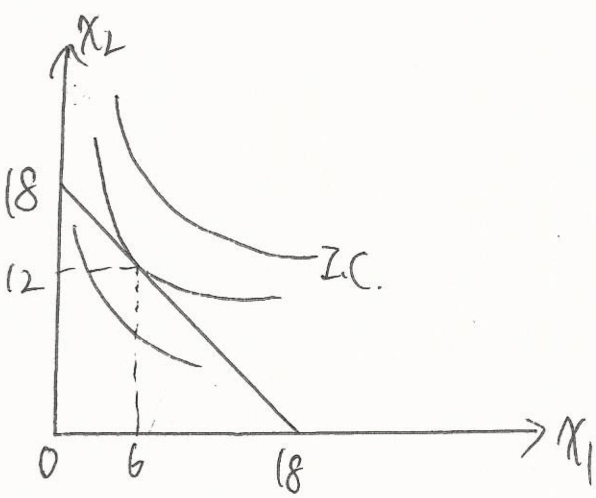
$\Rightarrow \frac{x_2}{2x_1}=\frac{4}{4}=1$

$\Rightarrow x_2=2x_1$

Plug into B.C: $72=4x_1+4(2x_1)$

$72=12x_1$

$\Rightarrow x_1^*=6$ then $x_2^*=12$



If $P_2=2$,

B.C: $72=4x_1+2x_2$

set $MRS=\frac{P_1}{P_2}$

$\Rightarrow \frac{x_2}{2x_1}=\frac{4}{2}=2$

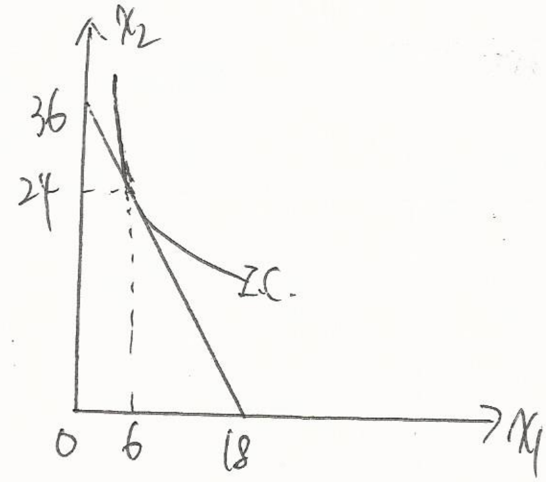
$\Rightarrow x_2=4x_1$

Plug into B.C:

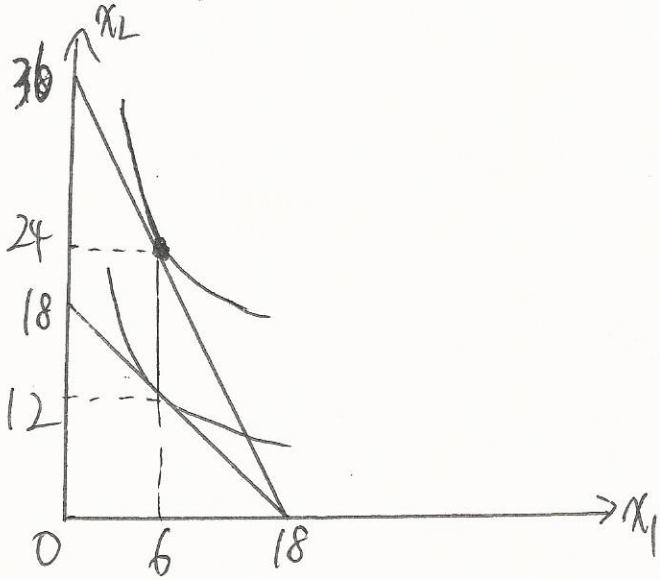
$72=4x_1+8x_1$

$72=12x_1$

$\Rightarrow x_1^*=6$, $x_2^*=4x_1^*=24$



If draw it on a same diagram:



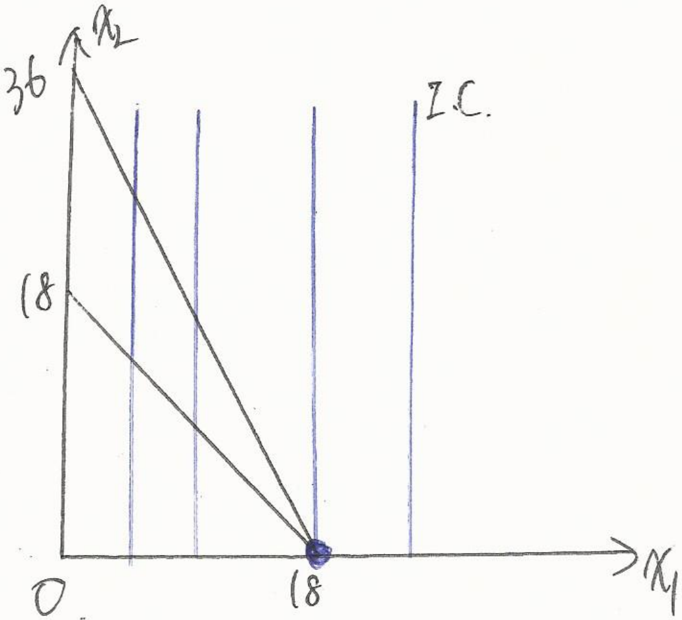
d). $U = x_1$, (The consumer doesn't care x_2)

Easy! $\longrightarrow$ Never buy any x_2! $x_2^* = 0$

$m = P_1 x_1 \Rightarrow x_1^* = \frac{m}{P_1}$

$$\left.\begin{array}{l} P_2 = P_1 = 4 \Rightarrow x_1^* = \frac{72}{4} = 18 \\ P_1 = 4,\ P_2 = 2 \Rightarrow x_1^* = \frac{72}{4} = 18 \end{array}\right\}$$ Optimal choice doesn't change!

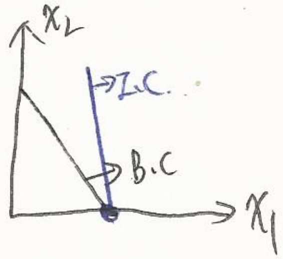
If draw it on a same diagram,



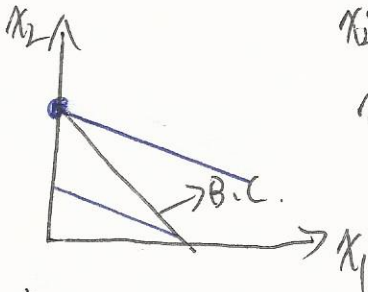
2. $U = x_1 + x_2 \rightarrow x_2 = U - x_1$

$MRS = 1$

If $MRS > \frac{P_1}{P_2}$, buy only x_1; $x_1^* = \frac{m}{P_1}$, $x_2^* = 0$



If $MRS < \frac{P_1}{P_2}$, buy just x_2. $x_2^* = \frac{m}{P_2}$, $x_1^* = 0$



If $MRS = \frac{P_1}{P_2}$, any bundles on the ~~I.C.~~ B.C., $x_1^* \in [0, \frac{m}{P_1}]$

If $m=60$, $P_2=10$, then

— If $\frac{P_1}{10}<1$ $(P_1<10)$, $x_1^*=\frac{m}{P_1}=\frac{60}{P_1}$

$\hookrightarrow \frac{P_1}{P_2}<MRS$

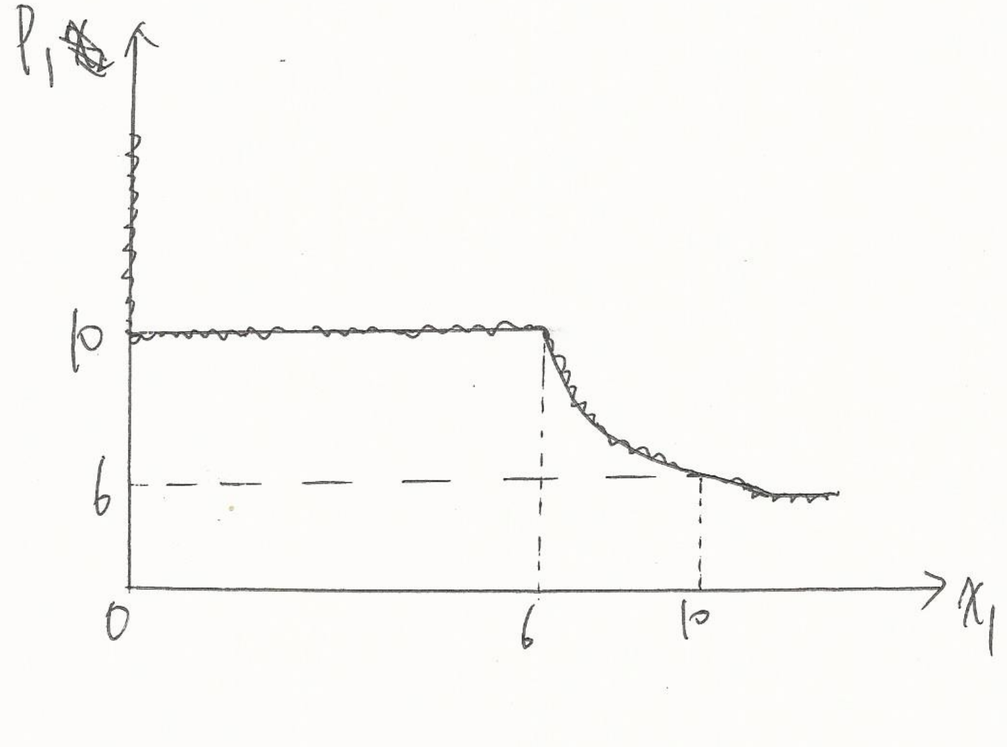
— If $\frac{P_1}{10}=1$ $(P_1=10)$, x_1^* is between 0 & $\frac{m}{P_1}=\frac{60}{10}=6$

$(x_1^* \in [0,6]$

— If $\frac{P_1}{10}>1$ $(P_1>10)$, $x_1^*=0$

$\hookrightarrow \frac{P_1}{P_2}>MRS$

$$\Rightarrow x_1^*=\begin{cases}\frac{60}{P_1} & P_1<10\\ [0,6] & P_1=10\\ 0 & P_1>10\end{cases}$$



3. (a) Note that $2x_1 = x_2$, so

$$m = P_1 x_1 + P_2 x_2$$
$$= P_1 x_1 + P_2(2x_1)$$
$$= (P_1 + 2P_2)x_1$$

$$\Rightarrow x_1^* = \frac{m}{P_1+2P_2} \quad \Rightarrow x_2^* = 2x_1^* = \frac{2m}{P_1+2P_2}$$

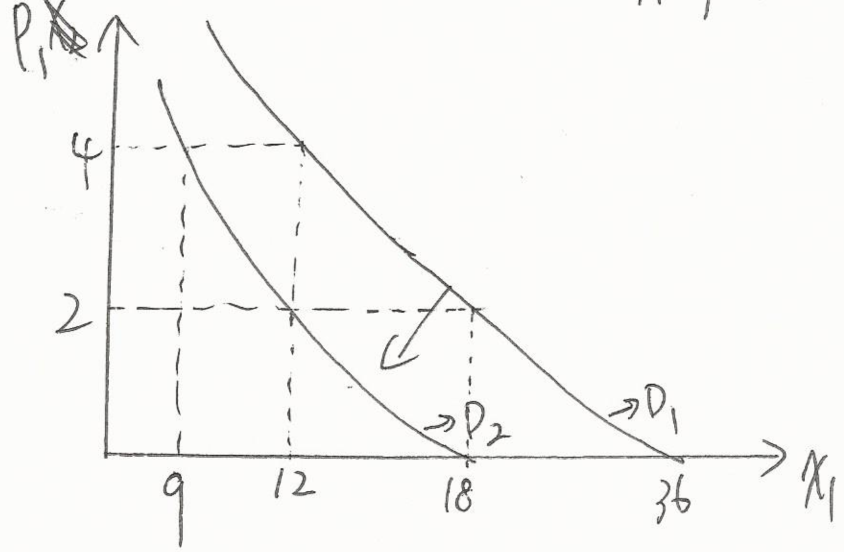
b). If $m\uparrow$, both x_1 & $x_2 \uparrow$. Hence normal.

c). $m=72,\ P_2=1 \Rightarrow x_1 = \frac{72}{P_1+2}$

P_1	0	1	2	4	6 ...
X_1	36	24	18	12	9 ...

d). $m=72,\ P_2=2 \Rightarrow x_1 = \frac{72}{P_1+4}$

P_1	0	2	4	6 ...
X_1	18	12	9	7.2 ...



$P_2\uparrow \Rightarrow D_1$ shifts inward.

(e). $x_1^* = \frac{m}{P_1+2P_2}$, $x_2^* = \frac{2m}{P_1+2P_2} = 2x_1^*$

$m=72,\ P_2=1,\ P_1=2$

$\Rightarrow x_1^* = \frac{72}{2+2} = 18$

$x_2^* = 2x_1^* = 36$

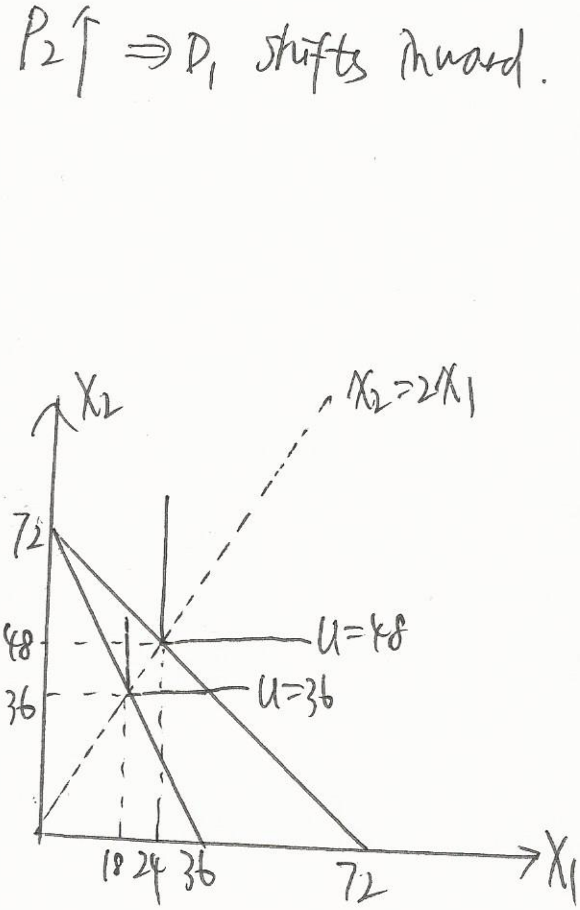
$U = \min\{2x_1^*, x_2^*\} = 36$

$m=72,\ P_1=P_2=1$

$\Rightarrow x_1^* = \frac{72}{1+2} = 24$

$x_2^* = 2x_1^* = 48$

$U = \min\{2x_1^*, x_2^*\} = 48$



Under the income drop, we still have the consumer buying (18, 36), but $P_1 = P_2 = 1$.

So $x_1 = \frac{\hat{m}}{P_1 + 2P_2} = 18 \Rightarrow \frac{\hat{m}}{1+2(1)} = 18 \Rightarrow \hat{m} = 54$

$\Rightarrow$ Income must fall by $72 - 54 = \$18$.

4. $x_1 = \frac{2m}{3P_1}$, B.C: $P_1 x_1 + P_2 x_2 = m$

$$P_1 \frac{2m}{3P_1} + P_2 \cdot x_2 = m$$
$$\frac{2}{3}m + P_2 x_2 = m$$
$$P_2 x_2 = \frac{1}{3}m$$
$$x_2 = \frac{m}{3P_2}$$

Before: $\left.\begin{matrix} P_1 = 2 \\ m = 36 \end{matrix}\right\} \Rightarrow x_1^a = \frac{2(m)}{3(P_1)} = \frac{2 \cdot 36}{3(2)} = \frac{72}{6} = 12$

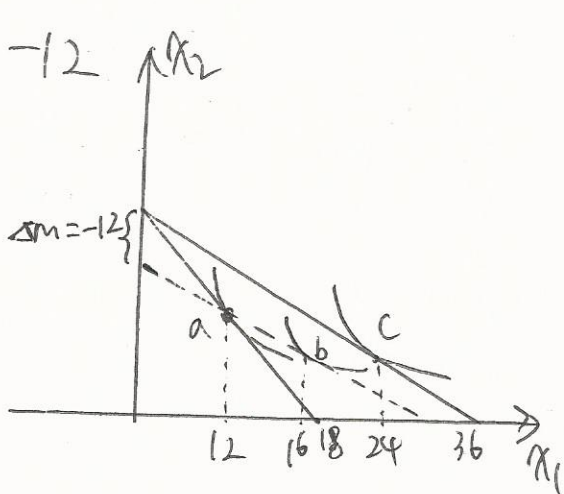
After: $\left.\begin{matrix} P_1 = 1 \\ m = 36 \end{matrix}\right\} \Rightarrow x_1^c = \frac{2(36)}{3(1)} = 24$

Overall change $= x_1^c - x_1^a = 24 - 12 = +12$

If gave income to afford at $x_1^a = 12$: $\Delta m = \Delta P_1 \cdot x_1 = (1-2) \cdot 12 = -12$

$$m + \Delta m = 36 - 12 = 24$$

$$x_1^b = \frac{2(24)}{3(1)} = 16$$



SE: $a \to b = 16 - 12 = +4$

IE: $b \to c = 24 - 16 = +8$

Overall: $a \to c = 24 - 12 = +12$

—THE END—