(b)

a. $$MU_B = \frac{\partial U}{\partial B} = 2BL^3$$

$$MU_L = \frac{\partial U}{\partial L} = 3B^2L^2$$

$$U = B^2L^3$$

$$L = U^{\frac{1}{3}} \cdot B^{-\frac{2}{3}}$$

$$MRS = \frac{dL}{dB} = -\frac{2}{3} U^{\frac{1}{3}} B^{-1\frac{2}{3}}$$

$$= -\frac{2}{3} B^{\frac{2}{3}} L \cdot B^{-1\frac{2}{3}}$$

$$= -\frac{2}{3} \frac{L}{B}$$

or: $$MRS = -\frac{MU_B}{MU_L} = -\frac{2}{3}\frac{L}{B}$$

It is well Behaved:

1. Complete, every Possible Bundle of B and L gets a utility value and can therefor be compared.
2. Reflexive, a Bundle with the same B and L gets the same utility value
3. transitive, utility is a number so. [redacted] it is transitive
4. Continuity, the indifference curves are continuous
5. More is Better, whenever Both B and L increase, utility goes up.

B. Yes, For any given amount she spends, if she spends more, then her utility goes up (more is Better).

C.

$$\begin{cases} MRS = -\frac{2}{3}\frac{L}{B} = -\frac{20}{10} & \left(\frac{P_B}{P_L}\right) \\ 1000 = 10L + 20B \end{cases}$$

$$\frac{L}{B} = 3 \leftarrow L = 100 - 2B$$

$$\frac{100-2B}{B} = 3$$

$$\frac{100}{B} - 2 = 3$$

$$\frac{100}{B} = 5$$

$$B = \frac{100}{5} = 20$$

$$L = 100 - 2B = 60$$

d.

$$\begin{cases} m = P_B B + P_L L \\ MRS : -\frac{2}{3}\frac{L}{B} = -\frac{P_B}{P_L} \end{cases}$$

~~[illegible]~~

$$P_L L = m - P_B B$$

$$\frac{2}{3}\frac{L}{B} = \frac{P_B}{P_L}$$

$$2 L P_L = 3 B P_B$$

$$\cancel{2 L P_L = 3m - 3 L P_L}$$

$$\cancel{5 L P_L = 3m}$$

$$\cancel{L = \frac{3}{5}\frac{m}{P_L}}$$

$$2m - 2 P_B B = 3 P_B B$$

$$2m = 5 B P_B$$

$$B = \frac{2}{5}\frac{m}{P_B}$$

this tells you that the amount of money you spend on Books is $\frac{2}{5}$ th of the allowance :

$$\frac{B \cdot P_B}{m} = \frac{2}{5}$$

independent of P_L

e

$B = \frac{2}{5}\frac{m}{P_B}$ [redacted] $L = \frac{3}{5}\frac{m}{P_B}$

[redacted]

$\xi_B = \frac{\partial B}{\partial m}\frac{m}{B} = \frac{2}{5}\cdot\frac{1}{P_B}\cdot\frac{m}{B}$

$= \frac{2}{5}\frac{1}{P_B}\cdot\frac{m}{\frac{2}{5}\frac{m}{P_B}}$

$= \frac{2}{5}\cdot\frac{5}{2} = 1$

$\xi_L = \frac{\partial L}{\partial m}\frac{m}{L} = \frac{3}{5}\frac{1}{P_L}\cdot\frac{m}{\frac{3}{5}\frac{m}{P_B}}$

$= 1$

$\xi_B \leq 1$ & $\xi_L \leq 1$ so Both are necessities

F. $U = 2B^{\frac{1}{2}} + L$ the indifference curve hits Both axes so corner solutions are Possible.

$m = P_B B + P_L L$

~~MRT = MRS~~ $MRS = MRT$

$\frac{MU_B}{MU_L} = \frac{P_B}{P_L}$

$\frac{B^{-\frac{1}{2}}}{1} = \frac{P_B}{P_L}$

$$B^{\frac{1}{2}} = \frac{P_L}{P_B}$$

$$m = P_B B + P_L L$$

$$P_B B = m - P_L L$$

$$B = \frac{P_L^2}{P_B^2}$$

$$B P_B = \frac{P_L^2}{P_B}$$

$$m - P_L L = \frac{P_L^2}{P_B}$$

$$P_L L = m - \frac{P_L^2}{P_B}$$

$$L = \frac{m}{P_L} - \frac{P_L}{P_B}$$

So

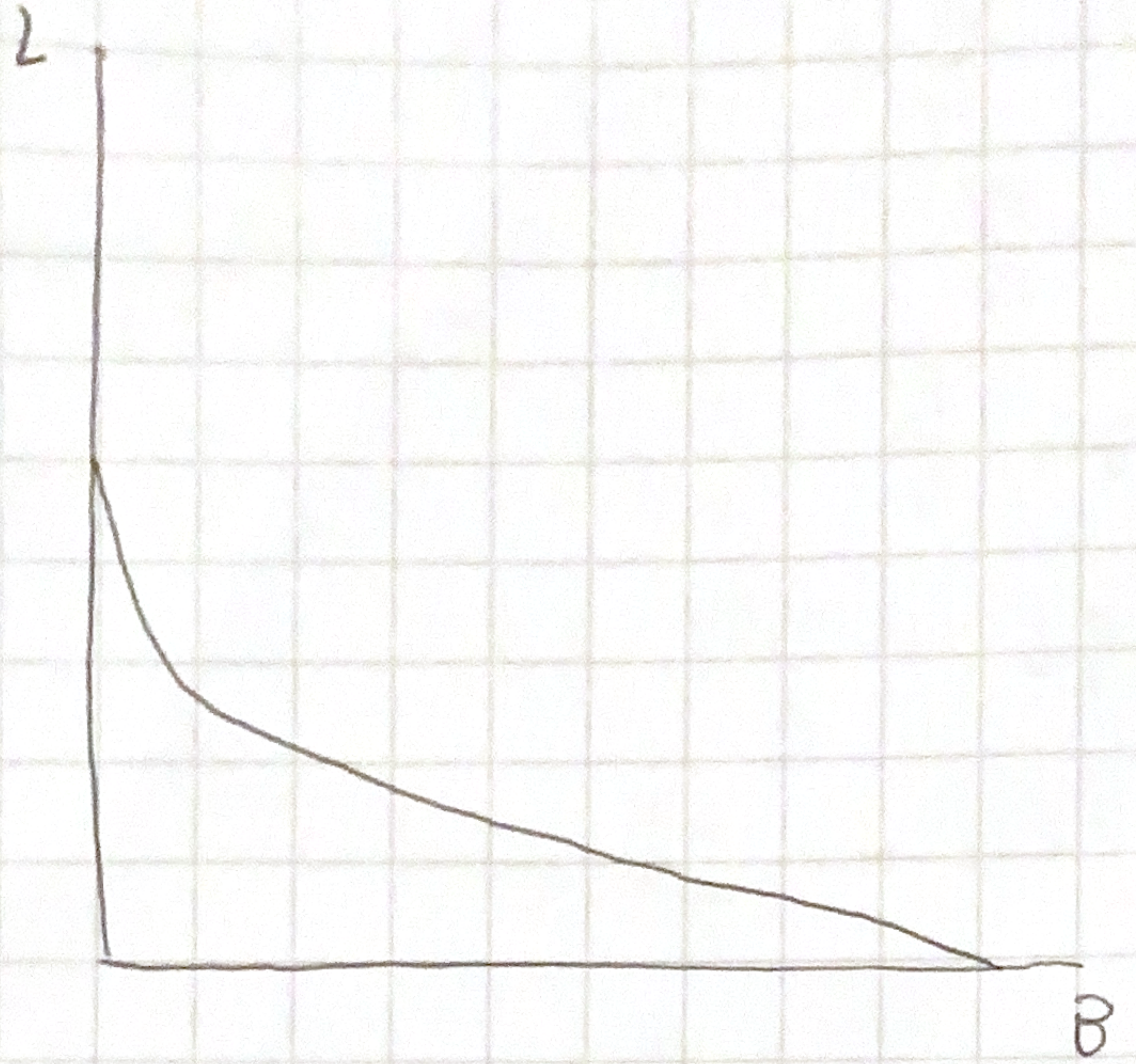
$$L = \frac{m}{P_L} - \frac{P_L}{P_B} \quad \text{if} \quad \frac{m}{P_L} > \frac{P_L}{P_B}$$

otherwise $L = \frac{m}{P_L}$

and $B = \frac{P_L^2}{P_B^2}$ if $\frac{P_L^2}{P_B^2} > 0$ which is allways the case

~~otherwise~~

But can still be a corner solution if $P_L = 0$



$$L = \frac{m}{P_L} - \frac{P_L}{P_B}$$

$$\xi_L = \frac{\partial L}{\partial m}\frac{m}{L} = \frac{1}{P_L} \cdot \frac{m}{\frac{m}{P_L} - \frac{P_L}{P_B}}$$

$$= \frac{m}{m - \frac{P_L^2}{P_B}}$$

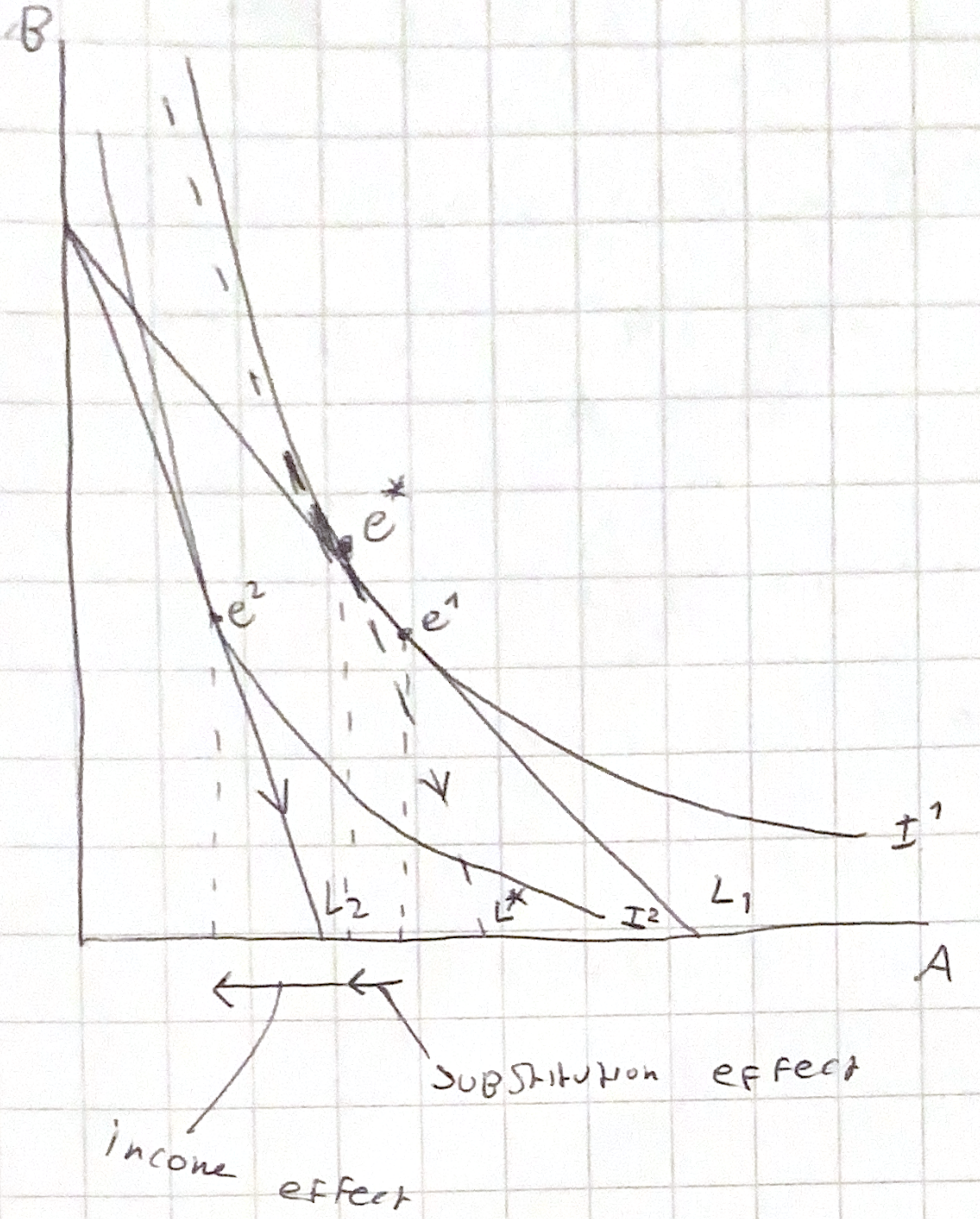
as Prices will ~~a~~ be Positive $m - \frac{P_L^2}{P_B} < m$

so $\frac{m}{m - \frac{P_L^2}{P_B}} > 1$ so it

is a luxury (except if $P_L = 0$)

7

a.



B. If the ~~[illegible]~~ apples are an inferior good and Bananas a normal good. ~~[illegible]~~

~~[illegible]~~

c. ~~her income Before is:~~ ~~$m = \omega_1 P_1 + \omega_2 P_2$~~

~~$m = 1 \cdot 1 + 3 \cdot 1$~~

~~$= 4$~~

& ~~after is [illegible]~~

$$\omega_1 P_1 + \omega_2 P_2 \geq x_1 P_1 + x_2 P_2$$

$$P_1(x_1 - \omega_1) + P_2(x_2 - \omega_2) \leq 0$$

Before :

$$1(A-3) + 1(B-1) = 0$$

$$A - 3 + B - 1 = 0$$

$$A + B = 4$$

$$B = 4 - A$$

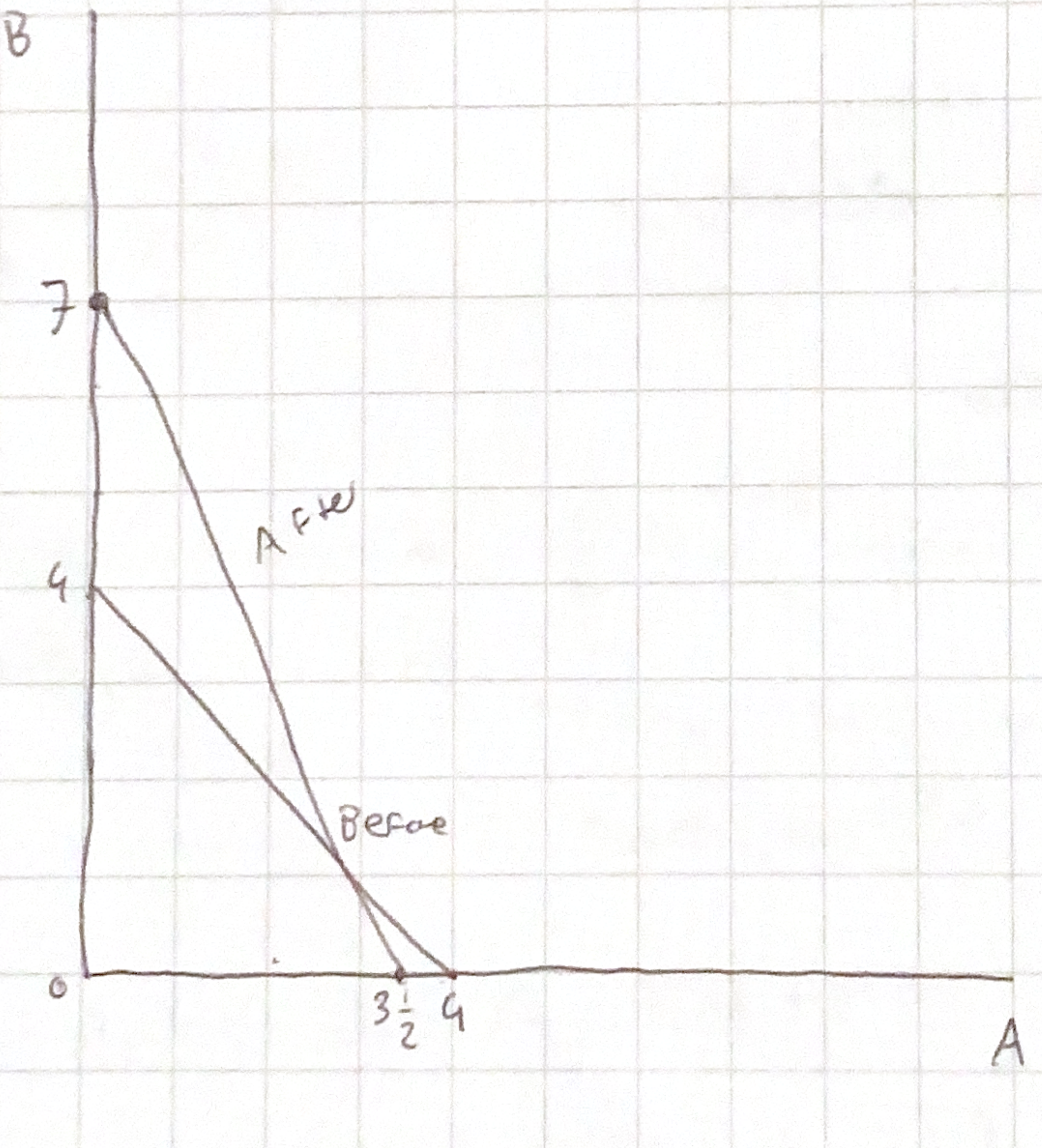
after

$$2(A-3) + 1(B-1) = 0$$

$$2A - 6 + B - 1 = 0$$

$$2A + B = 7$$

$$B = 7 - 2A$$



So not necessarily better off, although the total area of possible bundles is greater, if the individual really likes apples, he is not better off.

d.

Before:

$B = 4 - A$

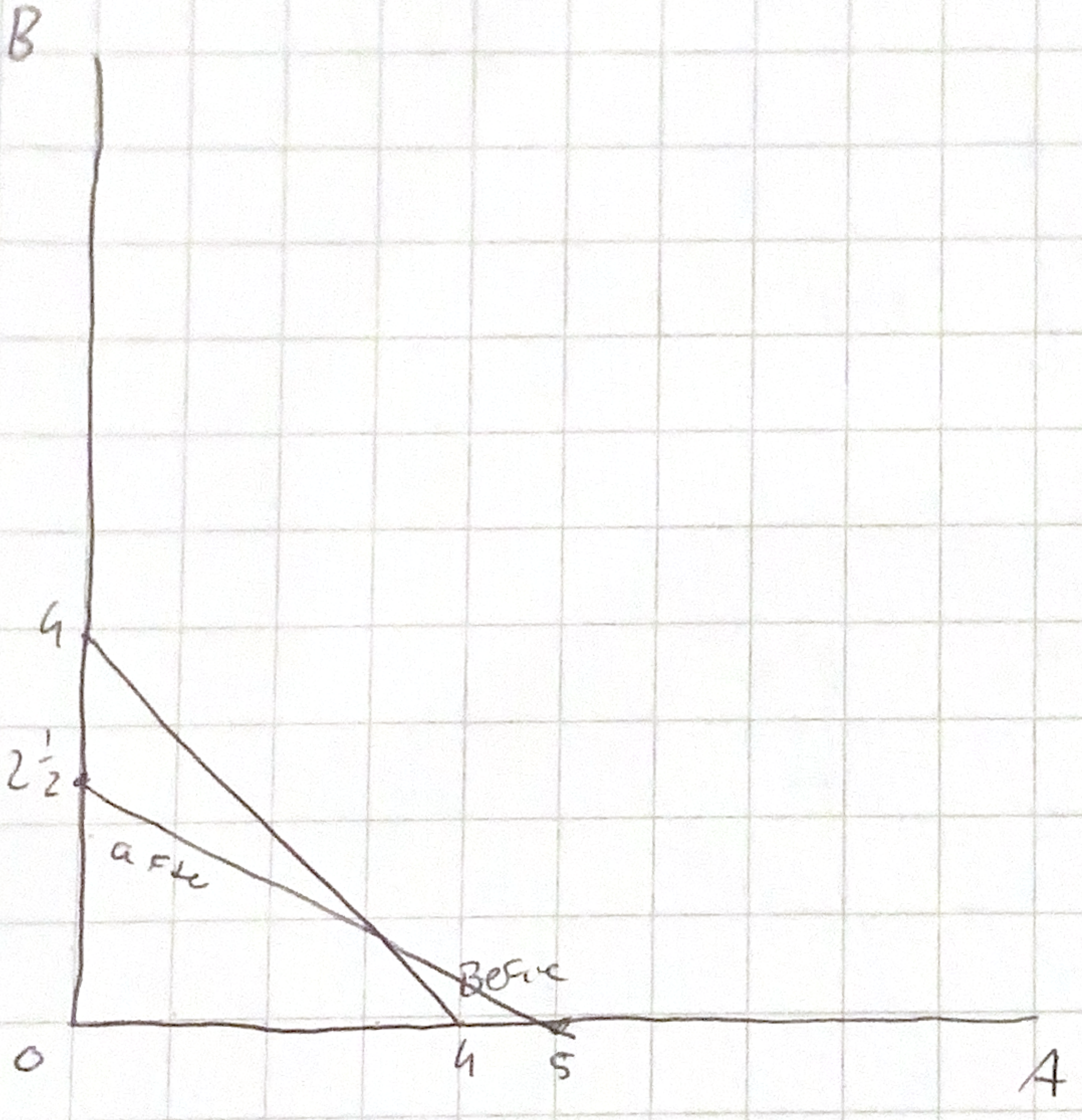
after:

$\frac{1}{2}(A-3) + 1(B-1) = 0$

$\frac{1}{2}A - 1\frac{1}{2} + B - 1$

$\frac{1}{2}A + B = 2\frac{1}{2}$

$B = 2\frac{1}{2} - \frac{1}{2}A$



the same again but vice versa.

(8)

$$x_1 = \beta \frac{m}{p_1}$$

$$\frac{\partial x_1}{\partial p_1} = \left.\frac{\partial x_1}{\partial p_1}\right|_U - \frac{\partial x_0}{\partial m} x_1$$

$$-\beta m p^{-2} = \left.\frac{\partial x_0}{\partial p_1}\right|_U - \beta p_1^{-1} \cdot \beta \frac{m}{p_1}$$

$$-\beta m p^{-2} =$$

$$\beta^2 p^{-2} m - \beta m p^{-2} = \left.\frac{\partial x_1}{\partial p_1}\right|_U$$

$$\left.\frac{\partial x_1}{\partial p_1}\right|_U = \beta m p^{-2} (\beta - 1)$$

$$\frac{\partial x_1}{\partial m} x_1 = \frac{\beta^2 m}{p^2}$$