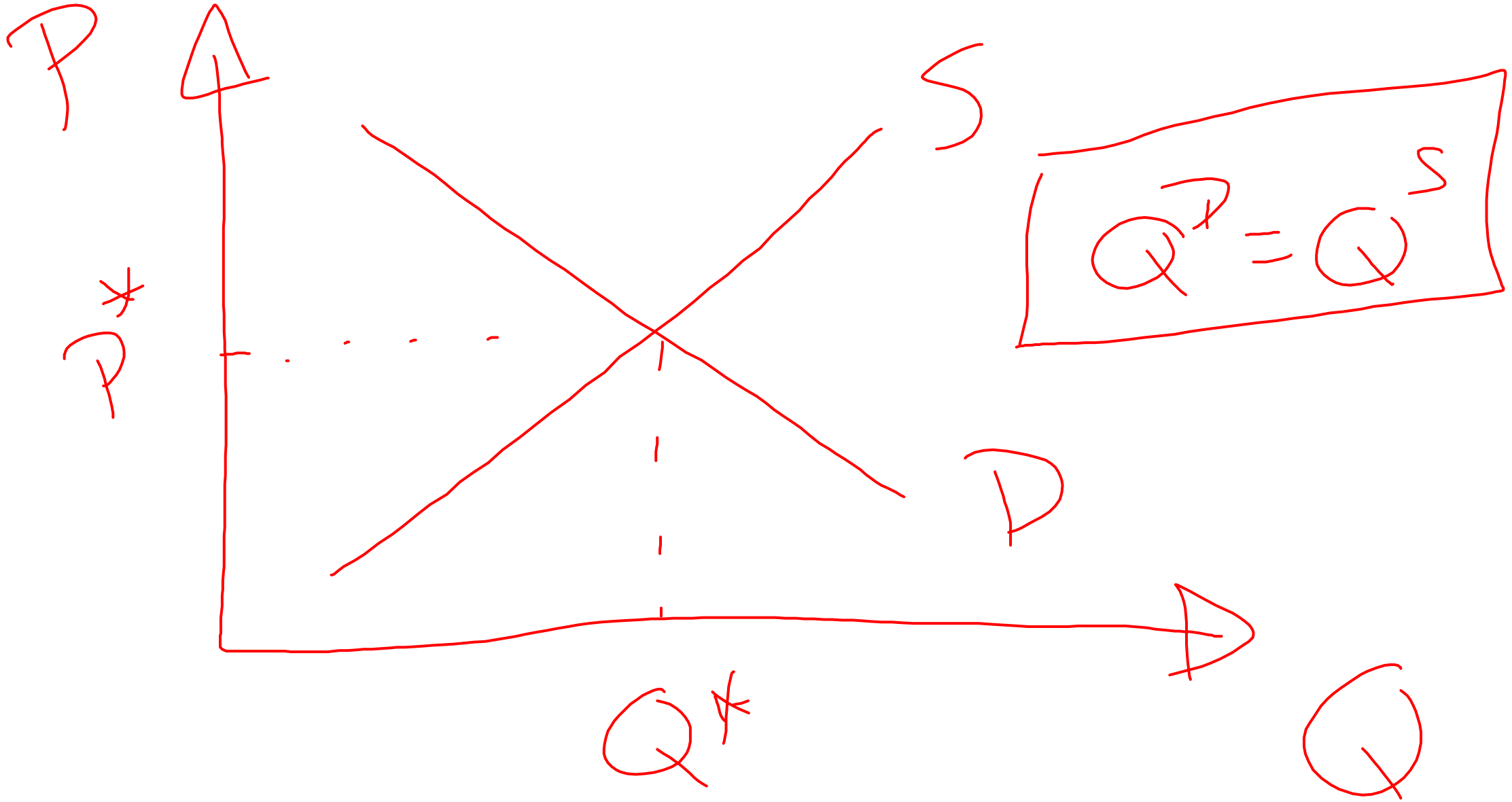

P
S
$Q^D = Q^S$
P^*
D
Q^*
Q

$$Q^D = Q^S$$

$$20{,}000 - 1{,}000P = -12{,}000 + 3{,}000P$$

$$20{,}000 + 12{,}000 - 1{,}000P = 3{,}000P$$

$$32{,}000 = 3{,}000P + 1{,}000P$$

$$4{,}000P = 32{,}000 \Rightarrow P = \frac{32{,}000}{4{,}000}$$

$$\boxed{P = 8}$$

$Q^D = 20{,}000 - 1{,}000P$

$P^* = 8$

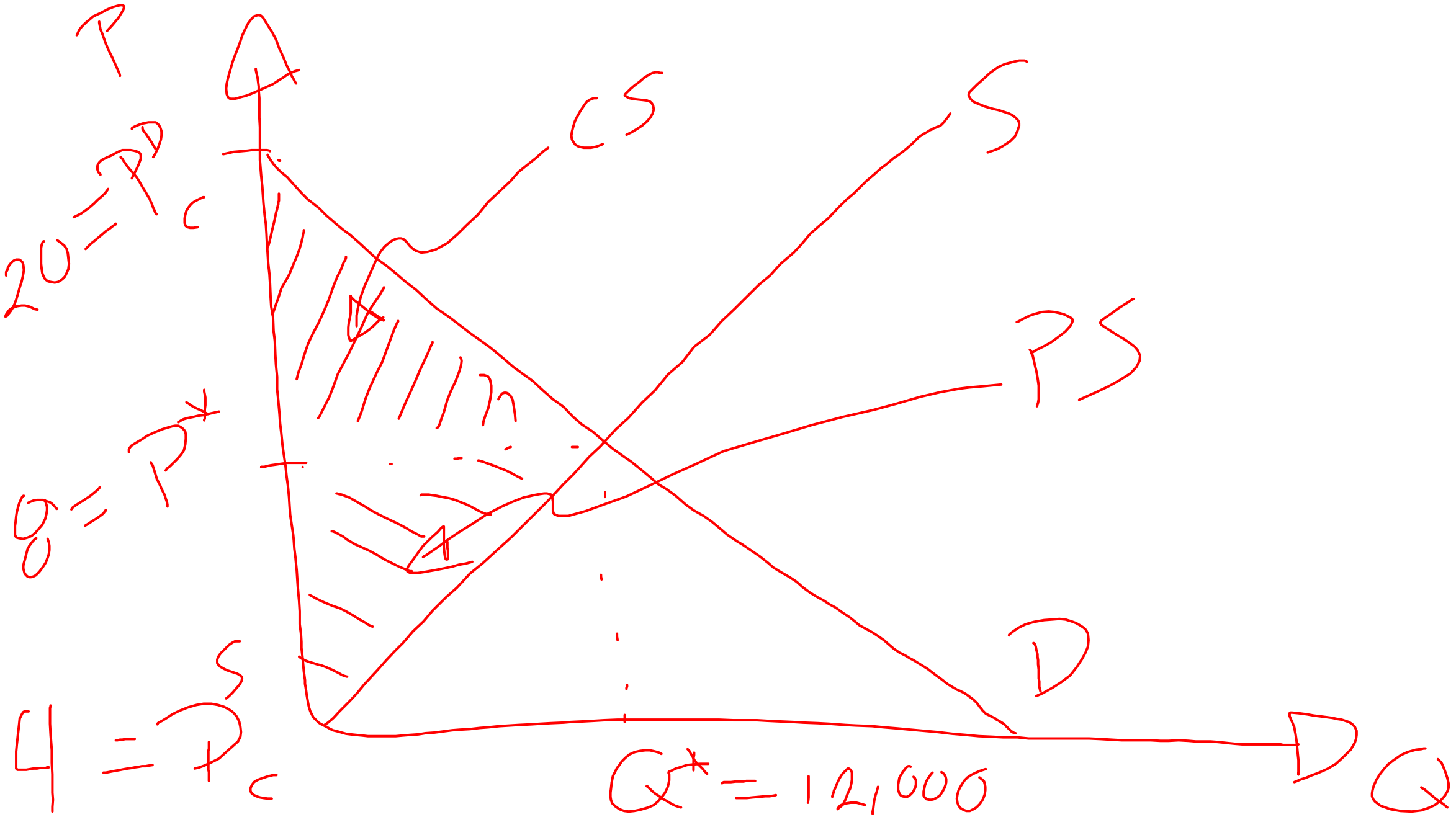
$Q^* = 20000 - 1{,}000(8) = 20{,}000 - 8{,}000$

$Q^* = 12{,}000$

$Q^S = -12{,}000 + 3{,}000P = -12{,}000 + 3{,}000(8)$

$Q^* = -12{,}000 + 24{,}000 = 12{,}000$

$Q^* = 12{,}000$


P
CS
S
20 = P^D_C
PS
Q = P*
D
4 = P^S_C
Q* = 12,000
Q

$$Q^D = 20{,}000 - 1{,}000P$$

$$0 = 20{,}000 - 1{,}000P$$

$$P_c^D = 20$$

$$Q^S = -12{,}000 + 3{,}000P$$

$$0 = -12{,}000 + 3{,}000P \Rightarrow \boxed{P_c^S = 4}$$

Question 2

$$Q^P = 6{,}000 - 1{,}500P$$

$$1{,}500P = 6{,}000 - Q^P$$

$$P = \frac{6{,}000}{1{,}500} - \frac{1}{1{,}500}Q^P$$

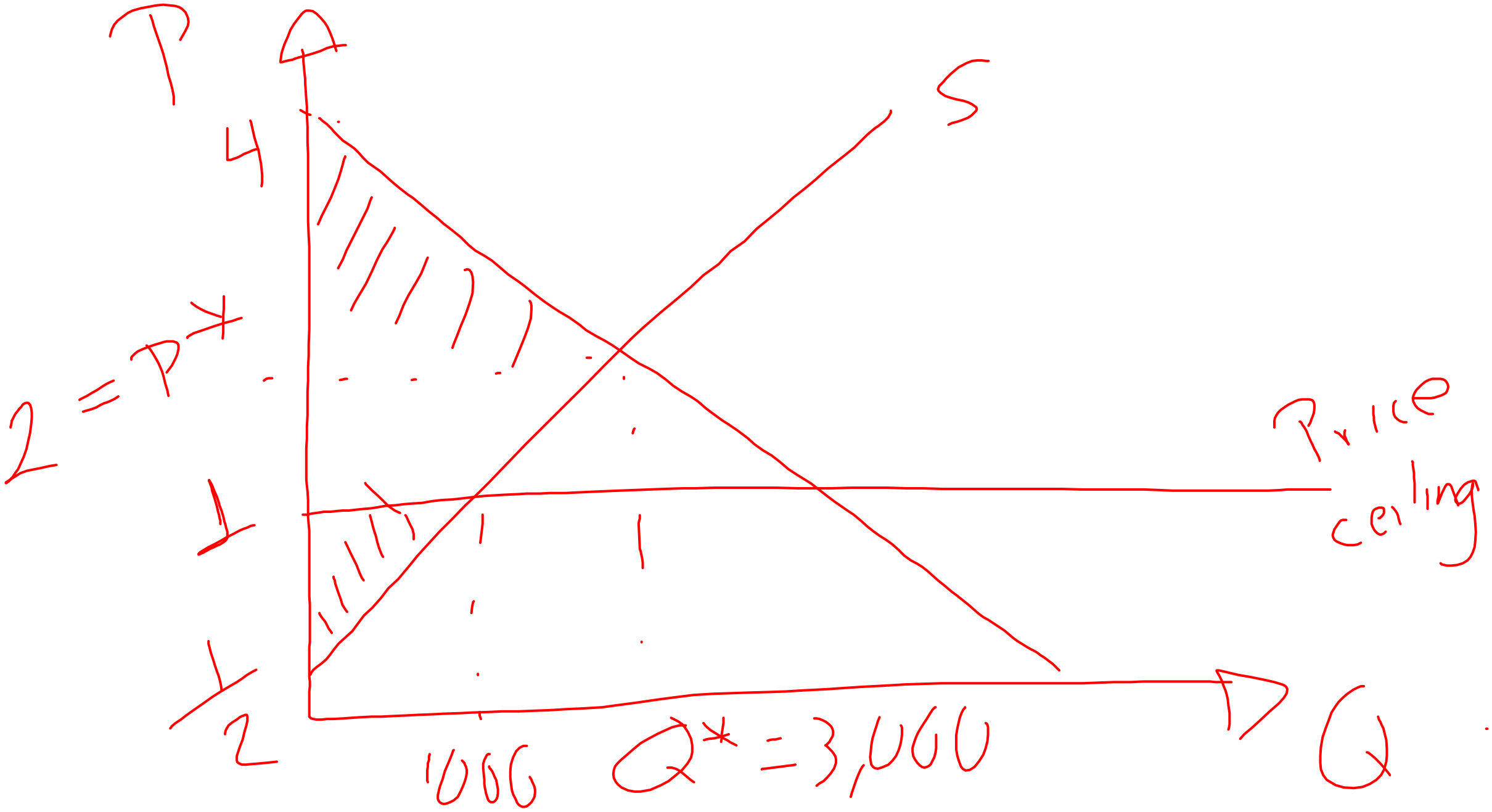
4 ⟸ intercept, slope

$$Q^S = -1{,}000 + 2{,}000P$$

$$2{,}000P = 1{,}000 + Q^S$$

$$P = \frac{1}{2} + \frac{1}{2{,}000}Q^S$$

intercept slope


P
4
S
2 = P*
Price
ceiling
1
1
2
1066
Q* = 3,066
Q

$$Q^D = Q^S$$

$$6{,}000 - 1{,}500P = -1{,}000 + 2{,}000P$$

$$6{,}000 + 1{,}000 = 2{,}000P + 1{,}500P$$

$$3500P = 7{,}000 \Rightarrow P = \frac{7000}{3500}$$

$$P^* = 2$$

$$Q^D = 6{,}000 - 1{,}500P \qquad P^* = 2$$

$$Q^* = 6{,}000 - 1{,}500(2)$$

$$\boxed{Q^* = 3{,}000}$$

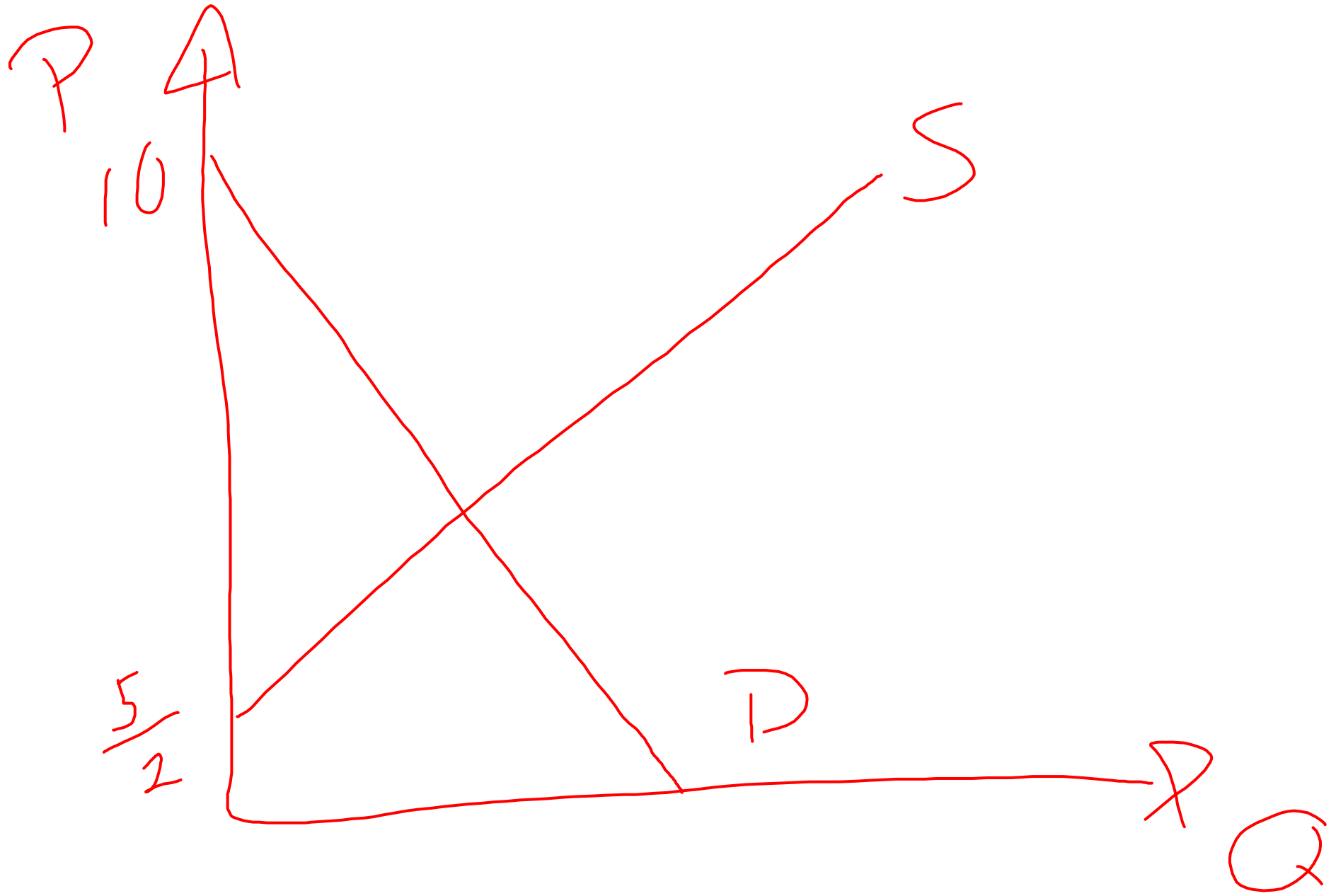
$$Q^D = 20 - 2P$$

$$2P + Q^D = 20 - 2P + 2P$$

$$2P + Q^D - Q^D = 20 - Q^D$$

$$P = \frac{20}{2} - \frac{Q^D}{2}$$

$$\boxed{P = 10 - \frac{1}{2} Q^D}$$


P
10
S
5/2
D
Q

$$U(x,y) = 4x + 2y$$

$$(2,4) \Rightarrow U(2,4) = 4(2) + 2(4)$$

$$U(2,4) = 8 + 8 = 16$$

$$u(x,y) = 4x + 2y$$

$$MU_x = \frac{\partial u(\cdot)}{\partial x} = 4$$

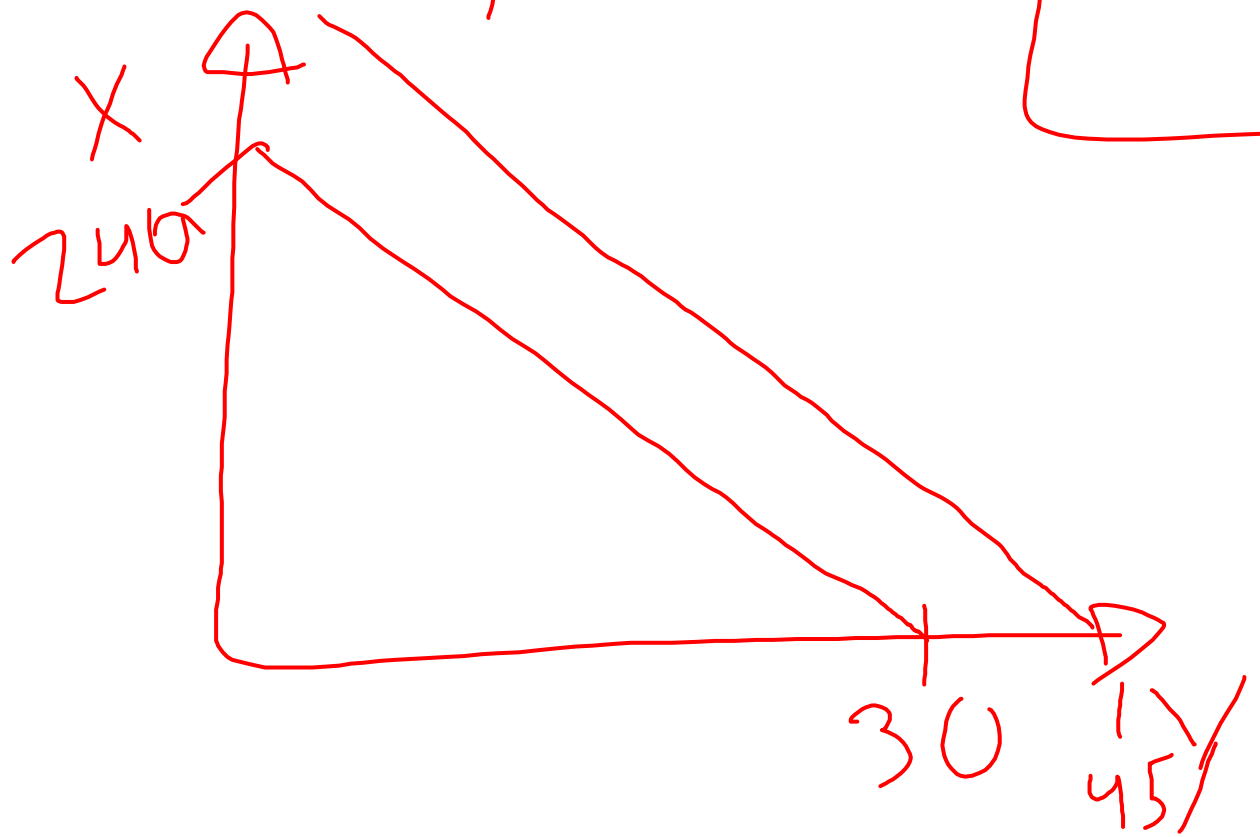
$$MU_y = \frac{\partial u(\cdot)}{\partial y} = 2$$

$$m = P_1 X_1 + P_2 X_2$$

$$I = P_x X + P_y Y \Rightarrow \boxed{-\frac{P_y}{P_x}}$$

$$\frac{I}{P_y} = \frac{240}{8} = 30$$

$$\frac{I}{P_y} = \frac{360}{8} = 45$$



Consumer theory

Q3.

$$I = P_x X + P_y Y$$

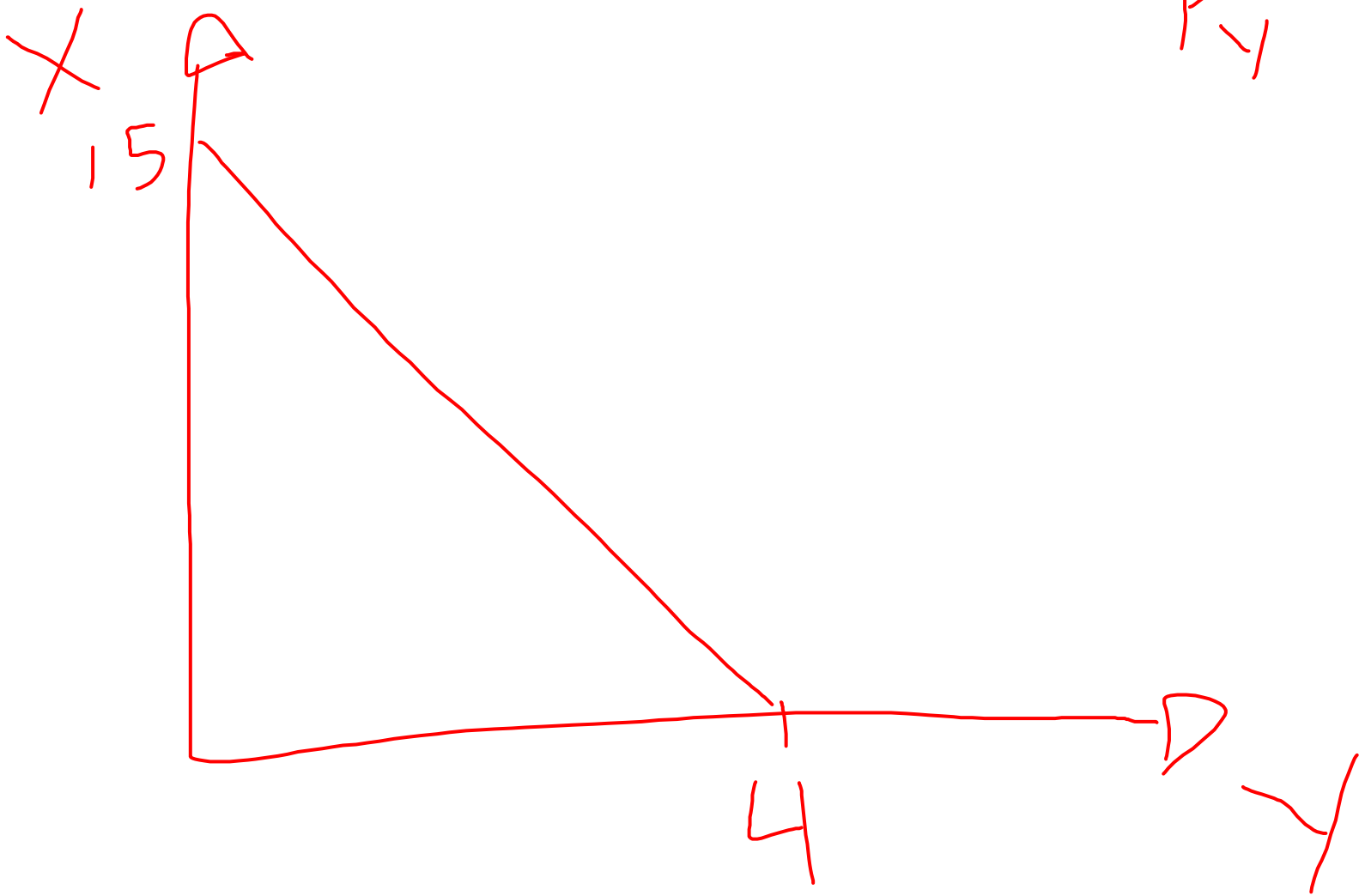
$$36 = 2X + \frac{15}{2} Y$$

$$2X + \frac{15}{2} Y - \frac{15}{2} Y = 30 - \frac{15}{2} Y$$

$$X = \frac{30}{2} - \frac{15}{4} Y \Rightarrow X = 15 - \frac{15}{4} Y$$

$$X = 15 - \frac{15}{2}Y$$

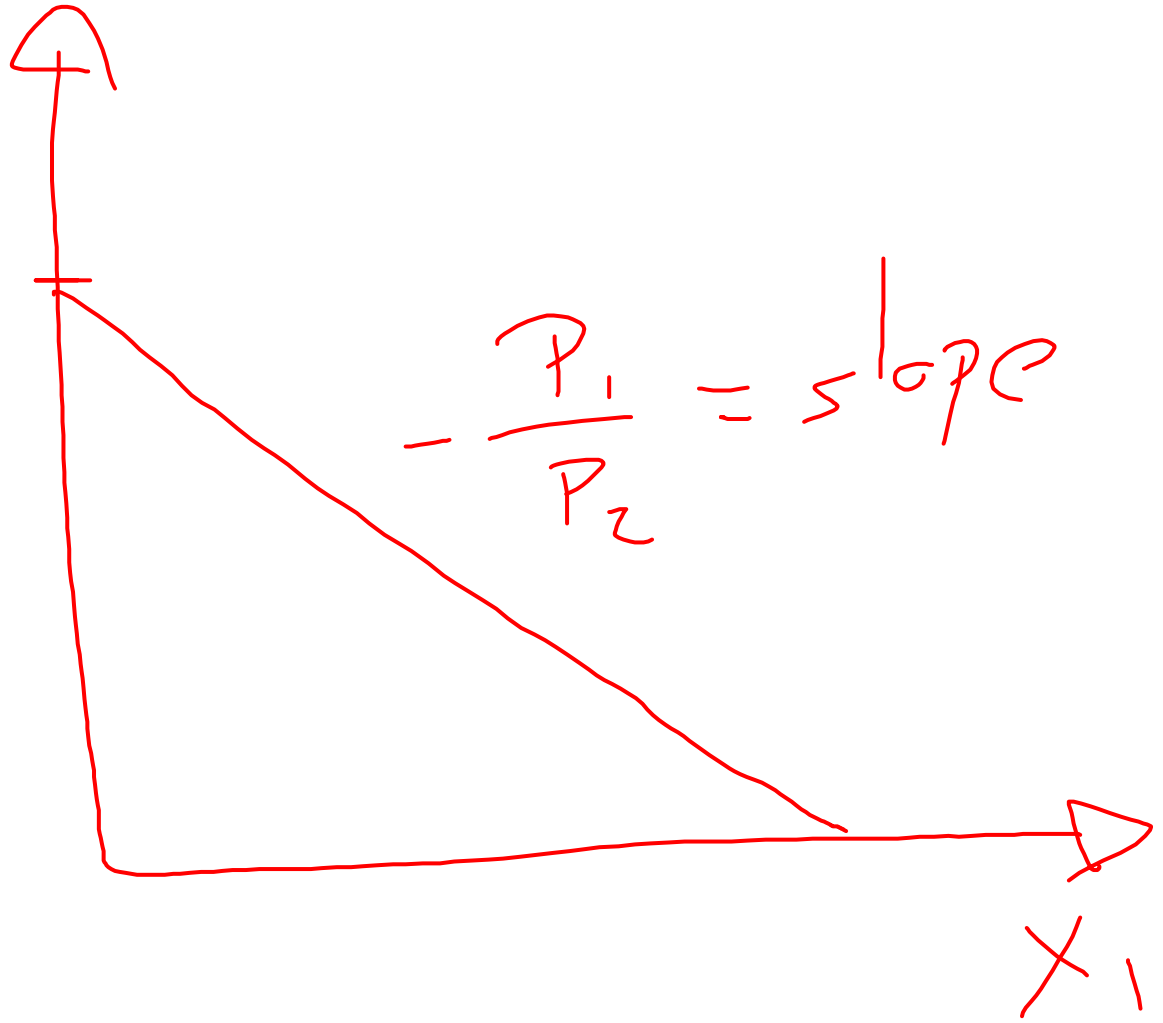
$$\frac{I}{P_Y} = \frac{30}{\frac{15}{2}} = \frac{60}{15} = 4$$



$$m = p_1 x_1 + p_2 x_2$$

$$p_2 x_2 = m - p_1 x_1$$

$$\boxed{x_2 = \frac{m}{p_2} - \frac{p_1}{p_2} x_1}$$



Q4

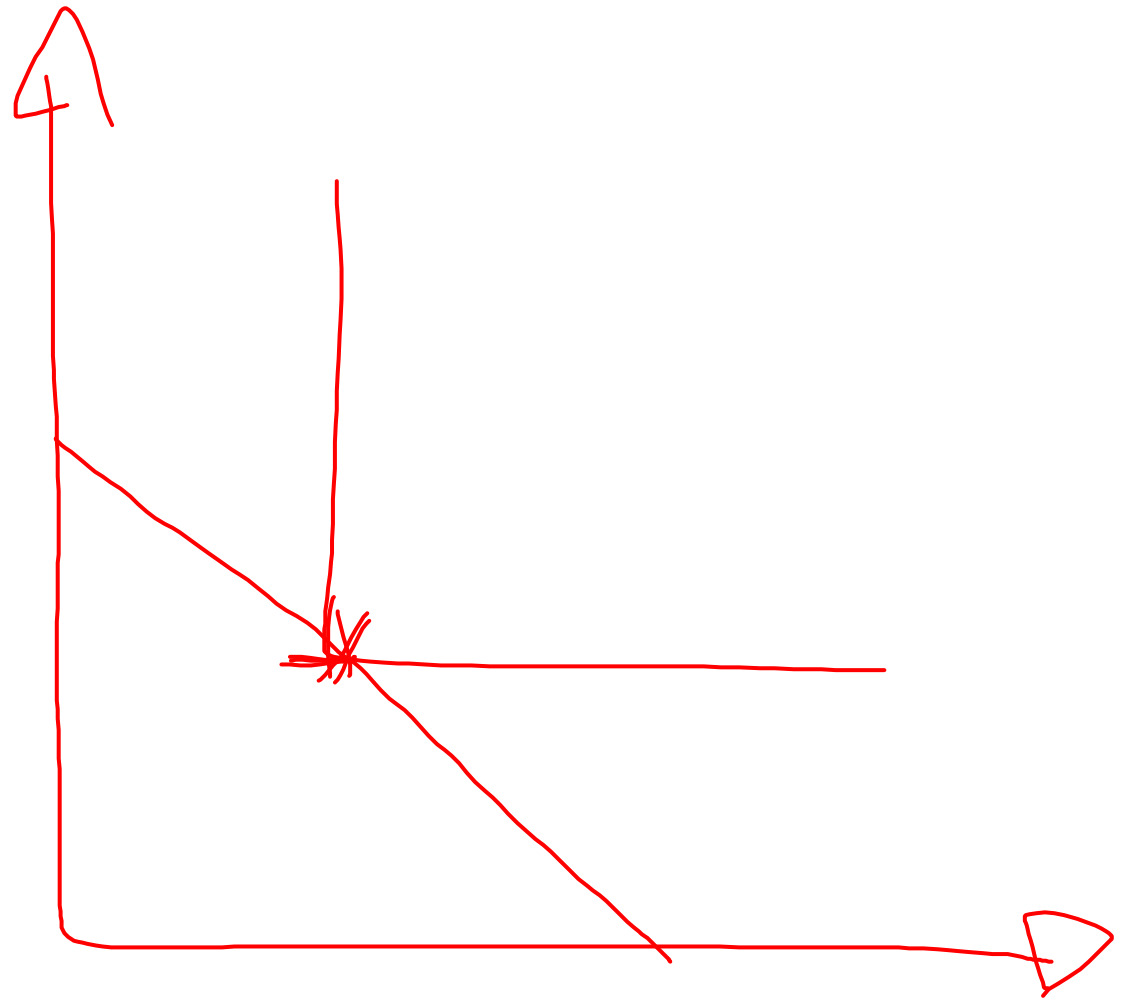
$U(c,s) = \min\{c,s\}$

$c = s = x$

$12 = 0.4x + 0.2x$

$12 = 0.6x$

$12 = \frac{6}{10}x \Rightarrow x = \frac{12(10)}{6} = 20$

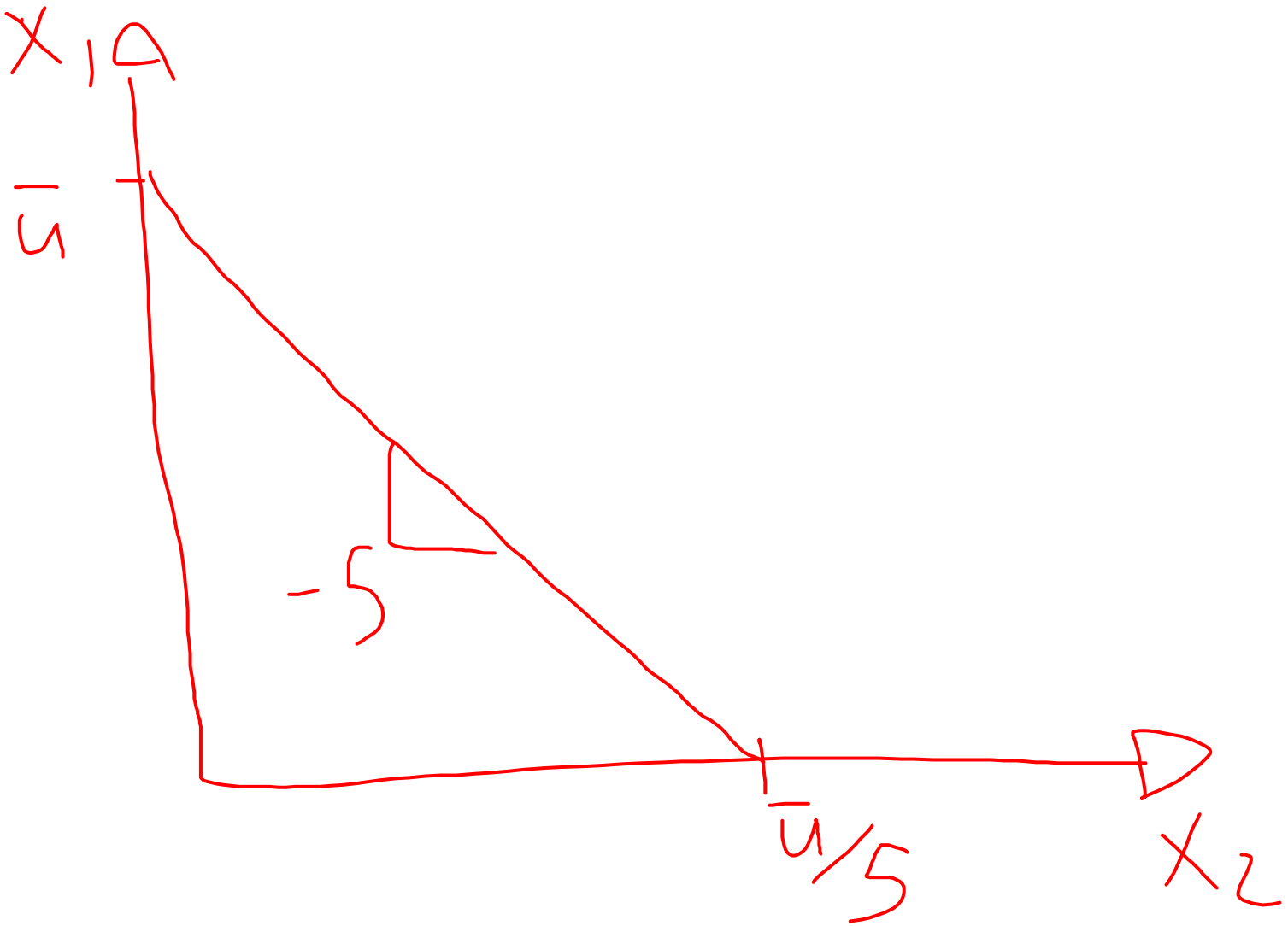


$$U(x_1, x_2) = x_1 + 5x_2$$

$$x_1 = \bar{u} - 5x_2$$

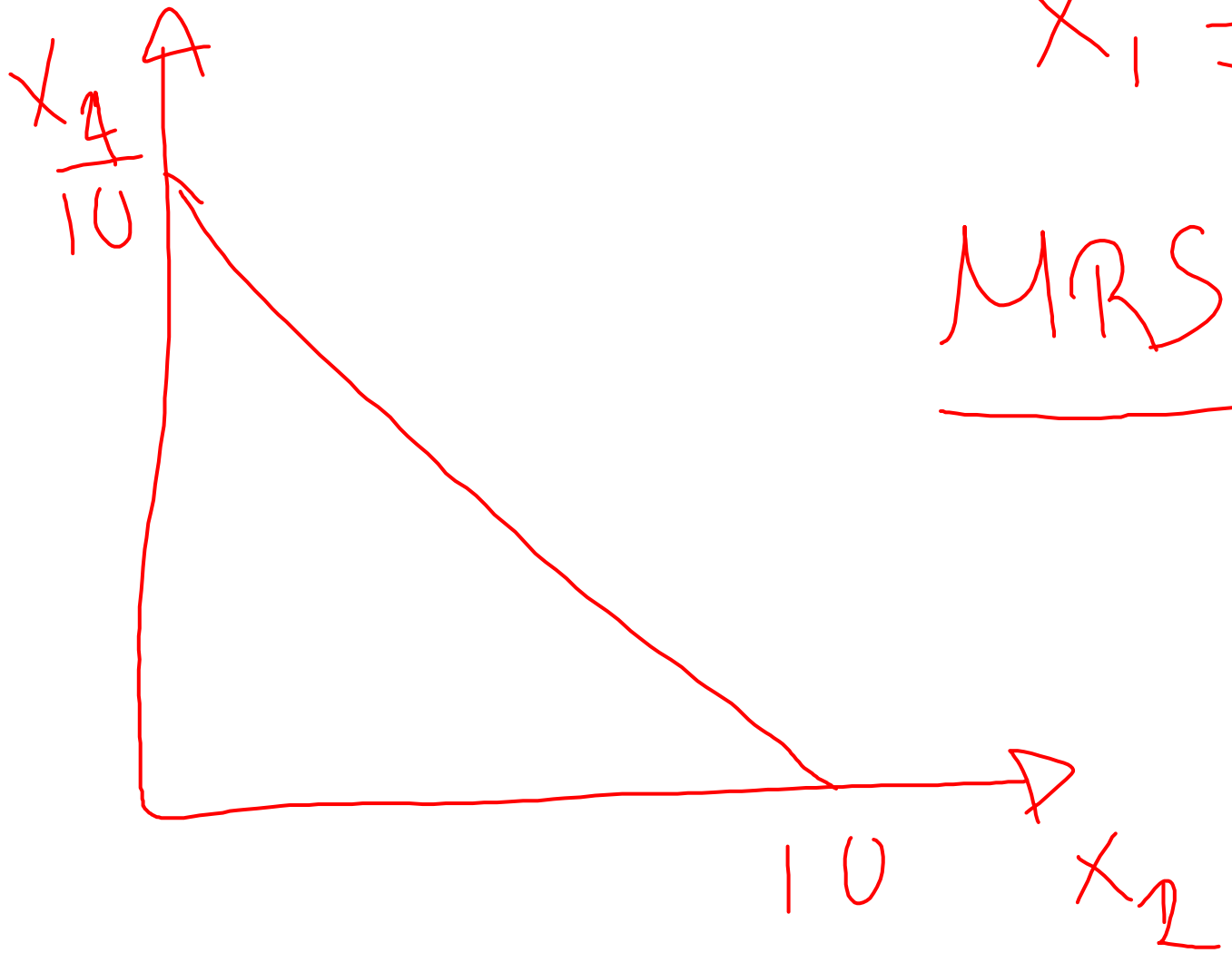
$$0 = \bar{u} - 5x_2$$

$$x_2 = \frac{\bar{u}}{5}$$



$10 = X_1 + X_2 \Rightarrow X_2 = 10 - X_1$

$X_1 = 10 - X_2$



$MRS = 5 > \frac{P_2}{P_1} = 1$

New BC:

$$X_1 = 10 - 10 X_2$$

$MRS < P_1/P_2$

$$U(x_1, x_2) = x_1^{1/4} x_2^{3/4}$$

compute $MRS_{12} = \frac{MU_1}{MU_2}$

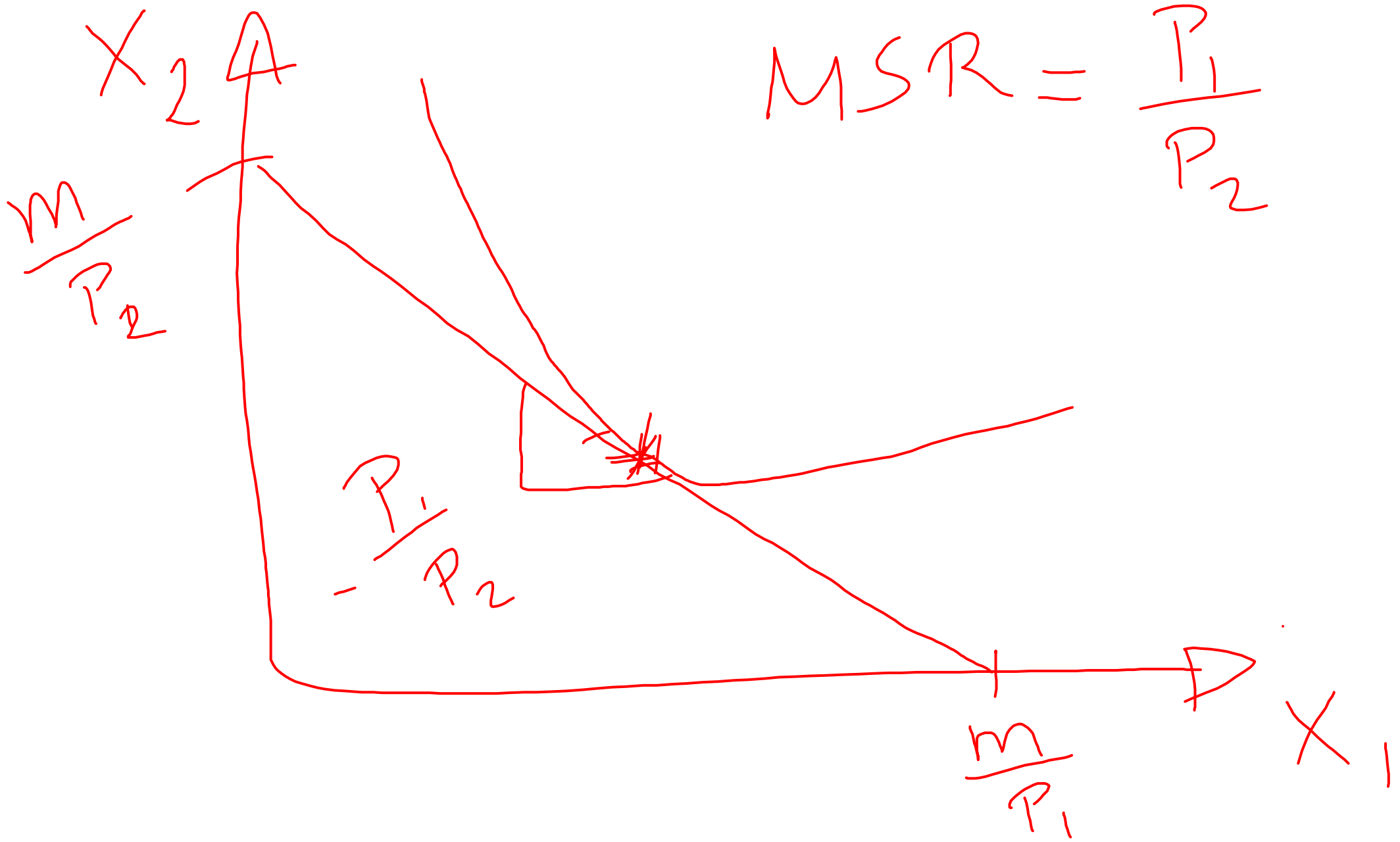
$$MU_1 = \frac{\partial U(\cdot)}{\partial x_1} = \frac{1}{4} x_1^{1/4-1} x_2^{3/4} = \frac{1}{4} x_1^{-\frac{3}{4}} x_2^{3/4}$$

$$MU_2 = \frac{\partial U(\cdot)}{\partial x_2} = \frac{3}{4} x_1^{1/4} x_2^{3/4-1} = \frac{3}{4} x_1^{1/4} x^{-1/4}$$

$$MRS = \frac{MU_1}{MU_2} = \frac{\frac{1}{4} X_1^{-3/4} X_2^{3/4}}{\frac{3}{4} X_1^{1/4} X_2^{-1/4}}$$

$$MRS = \frac{\frac{1}{4} X_2^{3/4} X_2^{1/4}}{\frac{3}{4} X_1^{1/4} X_1^{3/4}} = \frac{\frac{1}{4} X_2}{\frac{3}{4} X_1}$$

$$\boxed{MRS = \frac{1}{3} \frac{X_2}{X_1}}$$


X_2
$MSR = \frac{P_1}{P_2}$
$\frac{M}{P_2}$
$\frac{P_1}{P_2}$
$\frac{m}{P_1}$
X_1

$$\text{Max} \quad U(\cdot) = X_1^a X_2^b$$

$$s.t. \quad m = P_1 X_1 + P_2 X_2$$

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

$$MRS = \frac{MU_1}{MU_2}$$

$$U(x_1, x_2) = x_1^a x_2^b$$

$$MU_1 = \frac{\partial U(\cdot)}{\partial x_1} = a x_1^{a-1} x_2^b$$

$$MU_2 = \frac{\partial U(\cdot)}{\partial x_2} = b x_1^a x_2^{b-1}$$

$$MRS = \frac{MU_1}{MU_2} = \frac{a x_1^{a-1} x_2^b}{b x_1^a x_2^{b-1}} =$$

$$MRS = \frac{a x_1^{a-1} x_2^{b}}{b x_1^{a} x_2^{b-1}} = \frac{a x_1^{a} x_1^{-1} x_2^{b}}{b x_1^{a} x_2^{b} x_2^{-1}}$$

$$= \frac{a}{b} \frac{x_1^{-1}}{x_2^{-1}} = \frac{a}{b} \frac{x_2}{x_1}$$

$$\boxed{MRS = \frac{a}{b} \frac{x_2}{x_1}}$$

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

$$\frac{a}{b}\frac{X_2}{X_1} = \frac{P_1}{P_2} \Rightarrow \boxed{X_2 = \frac{b}{a}\frac{P_1}{P_2}X_1}$$

$$m = P_1X_1 + P_2X_2$$

$$m = P_1X_1 + P_2\left[\frac{b}{a}\frac{P_1}{P_2}X_1\right]$$

$$m = p_1 x_1 + p_2 \left[\frac{b}{a} \frac{p_1}{p_2} x_1 \right]$$

$$m = p_1 x_1 + \frac{b}{a} p_1 x_1 = \left(1 + \frac{b}{a}\right) p_1 x_1$$

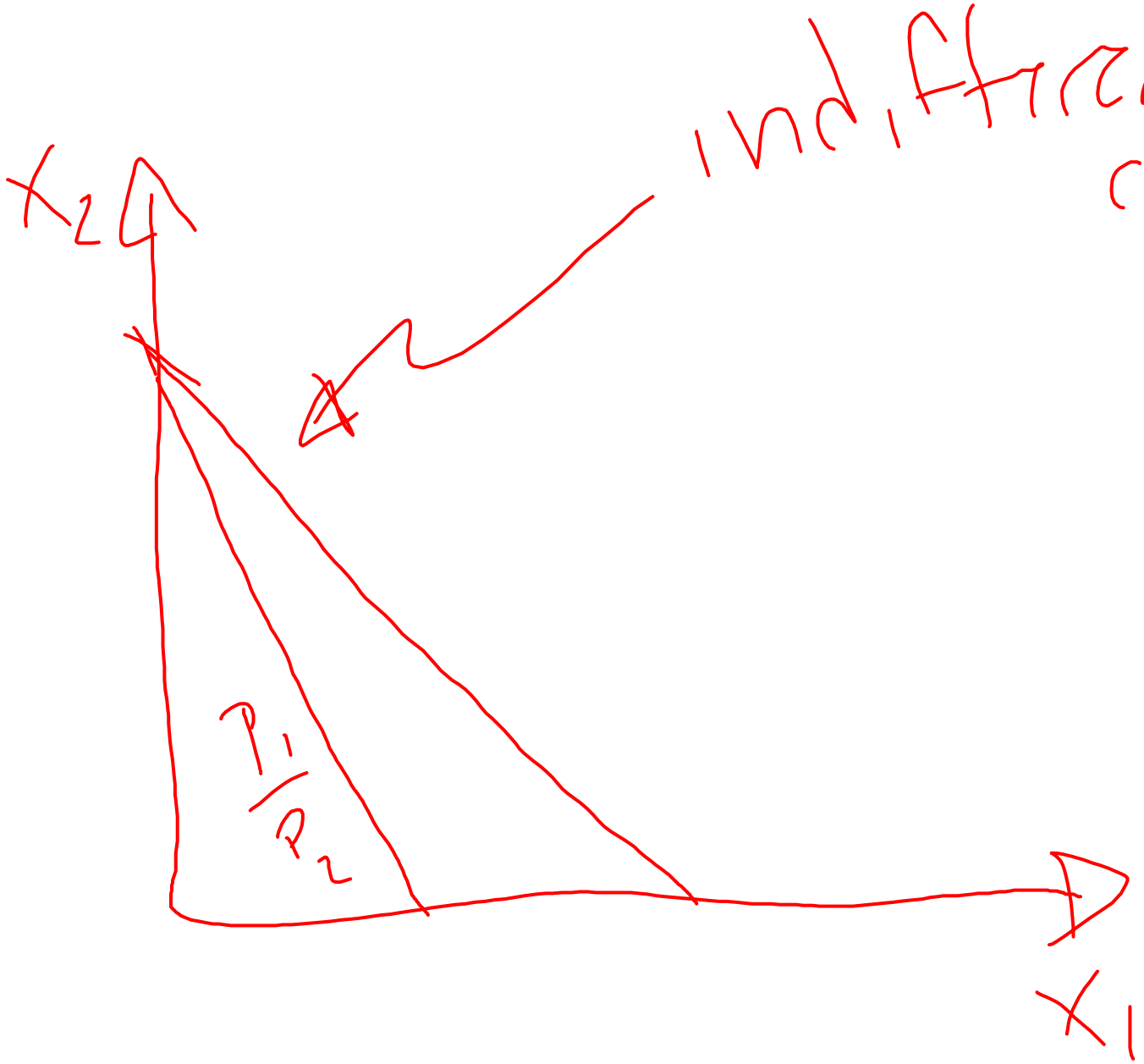
$$m = \left(\frac{a+b}{a}\right) p_1 x_1$$

$$\boxed{x_1^* = \left(\frac{a}{a+b}\right) \frac{m}{p_1}}$$

$$X_2 = \frac{b}{a}\frac{P_1}{P_2} X_1$$

$$X_2 = \frac{b}{a}\frac{P_1}{P_2}\left(\frac{a}{a+b}\right)\frac{m}{P_1}$$

$$X_2^* = \left(\frac{b}{a+b}\right)\frac{m}{P_2}$$



$$MRS_{1,2} = \frac{MU_1}{MU_2} = \frac{a}{b}$$

$$U(\cdot) = aX_1 + bX_2$$

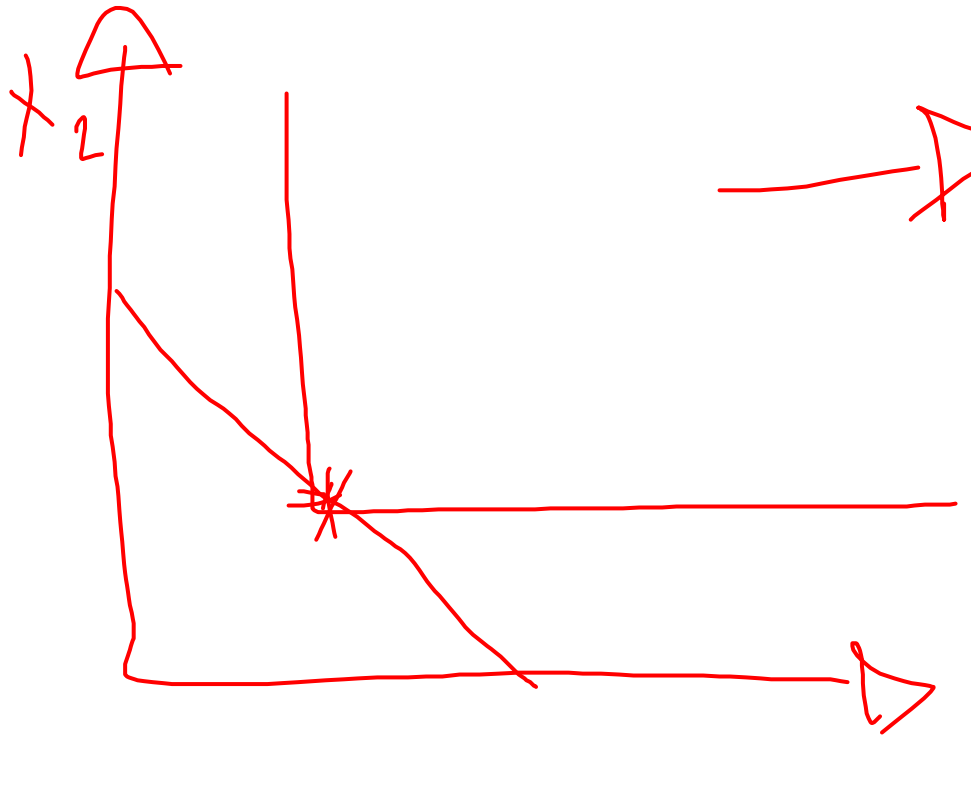
$$MU_1 = \frac{\partial U(\cdot)}{\partial X_1} = a$$

$$MU_2 = \frac{\partial U(\cdot)}{\partial X_2} = b$$

$$x_1^* = \begin{cases} \frac{m}{p_1} & \text{if } \frac{p_1}{p_1} < \frac{a}{b} \\ \in \left[0, \frac{m}{p_1}\right] & \text{if } \frac{p_1}{p_2} = \frac{a}{b} \\ 0 & \text{if } \frac{p_1}{p_2} > \frac{a}{b} \end{cases} \quad x_2^* = \begin{cases} 0 & \text{if } \frac{p_1}{p_2} < \frac{a}{b} \\ \in \left[0, \frac{m}{p_2}\right] & \text{if } \frac{p_1}{p_2} = \frac{a}{b} \\ \frac{m}{p_2} & \text{if } \frac{p_1}{p_2} > \frac{a}{b} \end{cases}$$

$$\max U(x_1, x_2) = \min\{ax_1, bx_2\}$$

$$s.t \quad m = p_1 x_1 + p_2 x_2$$



$$\rightarrow ax_1 = bx_2$$

$$x_1 = \frac{b}{a} x_2$$

$$m = p_1 x_1 + p_2 x_2$$

$$m = p_1 \left[\frac{b}{a} x_2\right] + p_2 x_2$$

$$m = \left[p_1 \frac{b}{a} + p_2\right] x_2$$

$$\boxed{x_2^* = \frac{m}{p_1 \frac{b}{a} + p_2}}$$

$$X_1 = \frac{b}{a} X_2$$

$$X_1^* = \frac{b}{a}\left[\frac{m}{P_1 \frac{b}{a} + P_2}\right]$$