# Homework : Answers

1. $Q = 4K + 6L$

output (customers) — capital — labor

A) $200 = 4 \times 20 + 6 * 20 = 200$

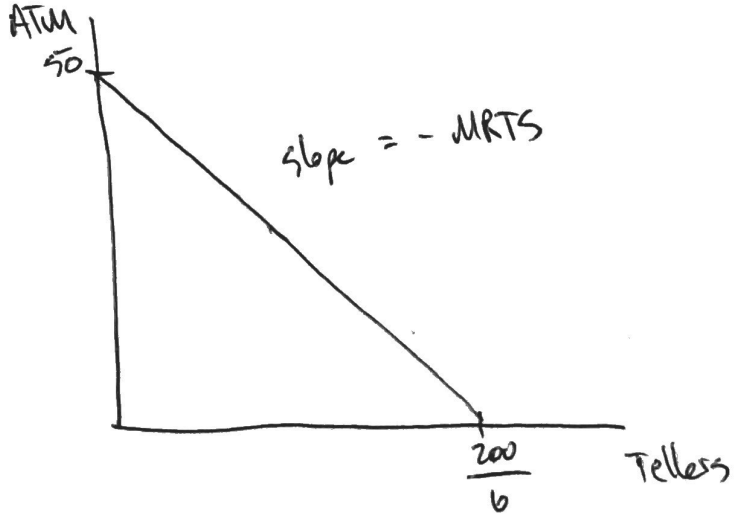
to maintain original service level (200)

$200 = 4 \cdot 17 + 6 \times L$

$\boxed{L = 22}$ Hire 2 additional tellers

B) No, the trade-off between ATMs and tellers is constant : 2 tellers for every 3 ATMs to maintain the same level of service.
They are perfect substitutes

C)



D) Production function is linear relationship
3 ATMs to 2 tellers

E) If the bank lays off 2 workers & installs 3 ATMs the # of customers served will be unchanged.

The cost of production will change:

$$P_{ATM} \cdot \underbrace{\Delta K}_{\text{change}} + P_{Teller} \cdot \underbrace{\Delta L}_{\text{change}} = \$20 \times 3 + 32 \cdot (-2)$$

$$= -4$$

F) To minimize cost the bank should only use ATMs

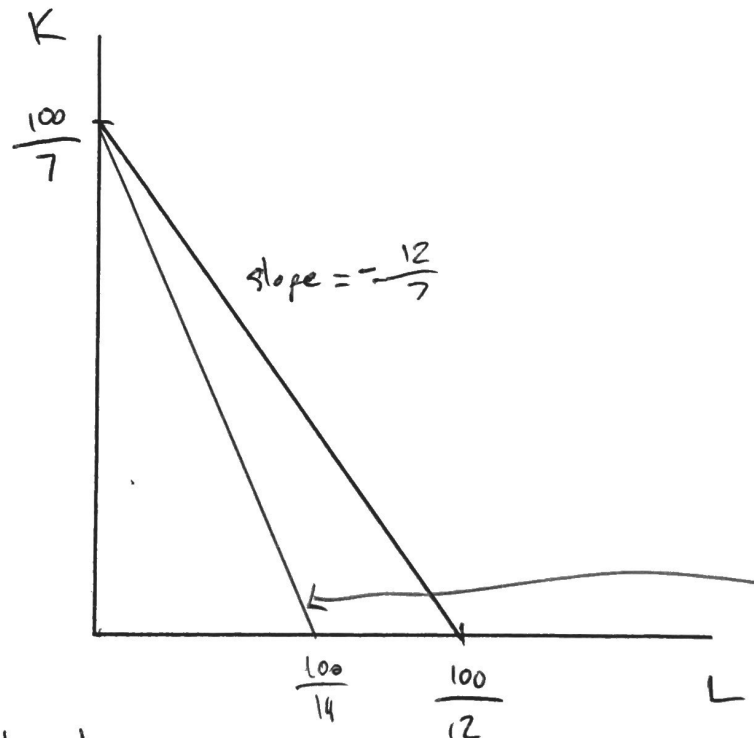
2) $w = \$12$ $r = \$7$

A) $\text{Cost} = \$12 \cdot L + \$7K$

B) $100 = \$12L + \$7K$

$$K = \frac{\$100}{\$7} - \frac{\$12}{\$7}L$$

C)




D) Vertical intercept is quantity of capital rented with $100 and no Labor

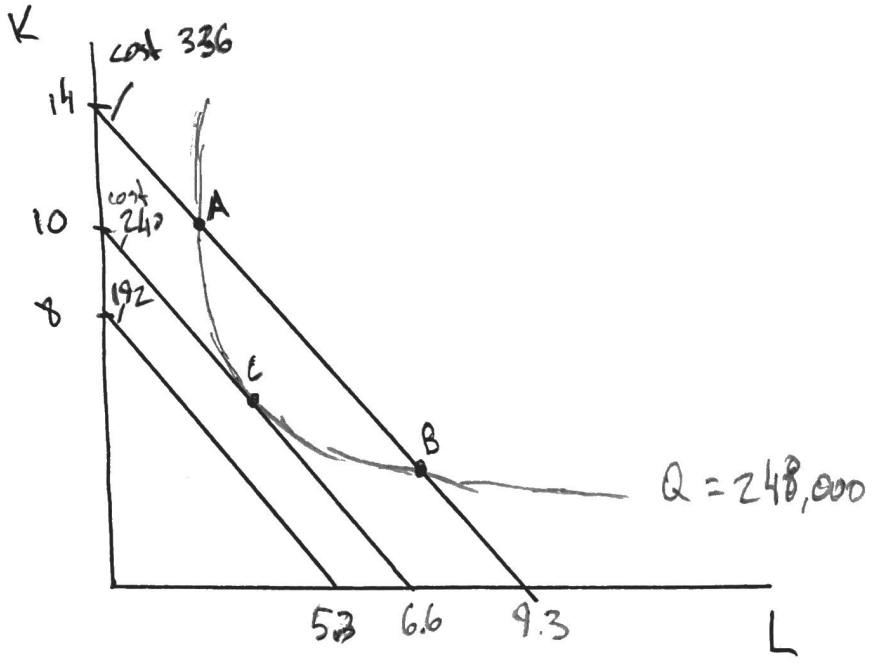
Horizontal intercept is quantity of Labor for $100 with no capital (machines)

E) Slope is the (negative) ratio of the wage and rental price of capital

$$\frac{-12}{7}$$

F) $K = \frac{100}{7} - 2L$

3)




A) When $L = 0$, $K = \frac{\text{cost}}{r}$

$14 = \frac{\text{cost}}{24} \Rightarrow \text{cost} = 14 \times 24 = 336$

$10 = \frac{\text{cost}}{24} \Rightarrow \text{cost} = 10 \times 24 = 240$

$8 = \frac{\text{cost}}{24} \Rightarrow \text{cost} = 8 \times 24 = 192$

B) $K = 0 \rightarrow L = ? = \frac{\text{cost}}{w}$

$\frac{336}{36} = 9.\bar{3}$ $\quad \frac{240}{36} = 6.6$ $\quad \frac{192}{36} = 5.3$

C) Yes, the firm can make 248,000 units for $336. This would be at either points A or B.

D) Minimum cost for 248,000 units is $240 at point C.

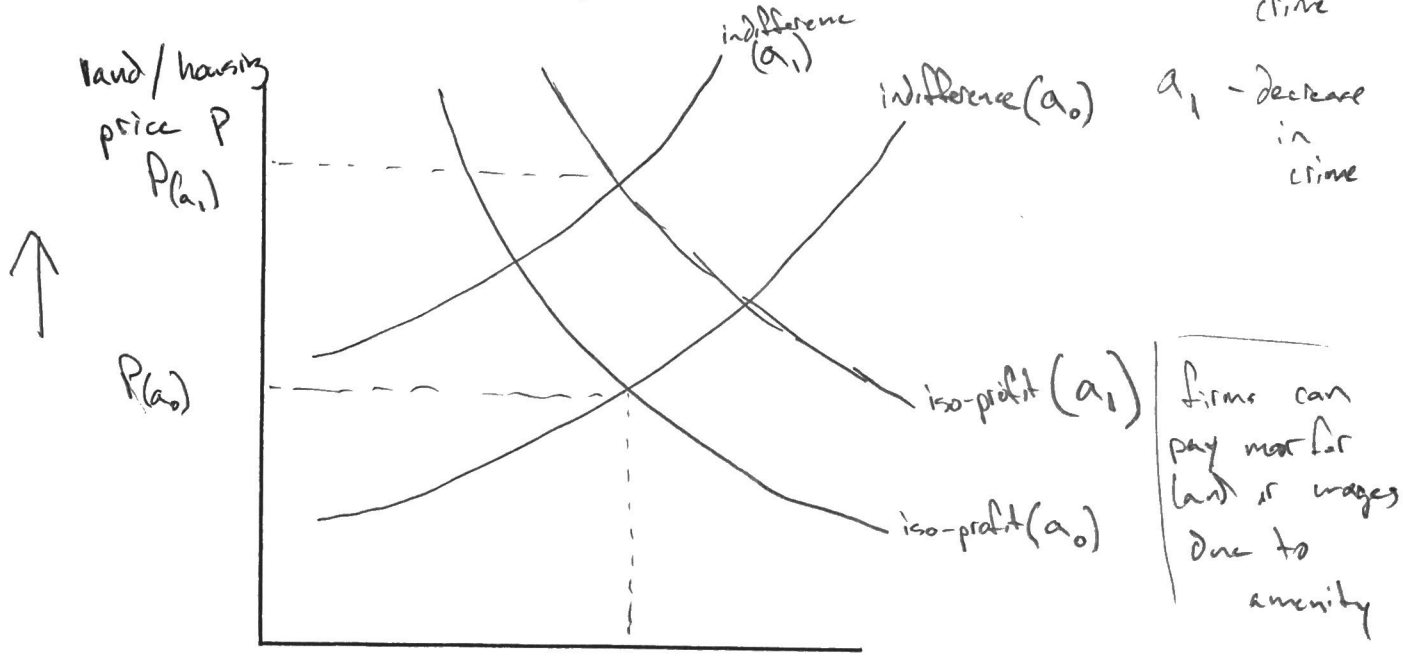
E) Equimarginal rule

$$\frac{MP_L}{w} = \frac{MP_K}{r}$$

$$\frac{400}{36} = \frac{X}{24} \qquad X = 266.\bar{6}$$

4) Equilibrium in the Rosen-Roback Model is that people and firms are indifferent across locations in geographic space. For people it means their utility is the same in location A & location B due to the differences in wages, housing prices and amenities.

5) Decrease in crime - firms cost decrease
- peoples utility increases




$a_0$ - original crime

$a_1$ - decrease in crime

firms can pay more for land or wages due to amenity

people willing to pay more for housing or less wages due to lower crime.

Overall effect. income or wages depends on the size of the shifts, land prices certainly increase.