Homework 4: Producer Theory **Economics 304**

1) Suppose that Gloucester Old Bank's customers can complete their transactions at a teller's window (involving labor) or at an ATM (involving capital). The production function for the bank's services is given as follows: $Q = 4K + 6L$, where Q is the number of customers served, K is the number of ATMs the bank has installed in town, and L is the number of tellers the bank has hired.

a) Suppose that Gloucester currently has 20 ATMs and 20 tellers. If 3 ATMs suddenly fail, how many additional tellers must the bank hire to maintain their original level of service?

b) Does your answer to (a) change if Gloucester originally uses 17 ATMs? 30 ATMs?

c) What do production isoquants look like for Gloucester Old Bank? (*Hint:* Graph different combinations of tellers and ATMs that can serve an arbitrary number of customers, such as 200.)

d) How would you verbally describe the relationship between tellers and ATMs?

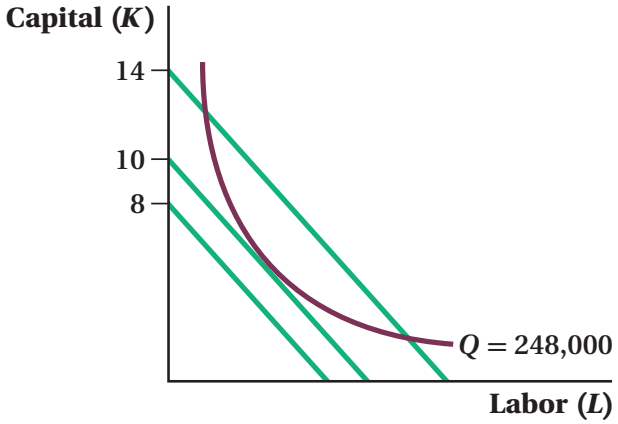
e) Suppose that installing and maintaining an ATM costs $20 and hiring a teller costs $32. What will happen to Gloucester's total number of customers served if it lays off 2 workers and installs 3 ATMs What will happen to bank costs?

f) Using the idea developed in (e), if Gloucester Old Bank is interested in minimizing costs, what strategy should it employ regarding its input mix?

2. Suppose that Zwagerman farms can hire workers for $12 per hour, or can rent capital for $7 per hour.

a. Write an expression for Zwagerman farms's total cost as a function of how many workers they hire and how much capital they employ.
b. Assume that Zwagerman farms wishes to hold their total costs to exactly $100. Use your answer from (a) to find the equation for an isocost line corresponding to exactly $100 of costs. Rearrange your equation to isolate capital.
c. Graph the equation for the isocost line, putting labor on the horizontal axis and capital on the vertical axis.
d. What is the vertical intercept of the line you drew? The horizontal intercept? What does each represent?
e. What is the slope of the line you drew? What does it represent?
f. Suppose that bargaining with the local labor union raises wages. Zwagerman farms must now pay $14 per hour. What happens to the isocost line corresponding to $100 of expenditure? Explain. Show the new isocost line on your graph.

3. Consider the production and cost information depicted below:



a. Suppose that capital can be hired for $24 per hour. Label each of the isocost lines with the appropriate total expenditure for the firm.

b. Suppose that labor can be hired for $36 per hour. Label the horizontal intercept of each isocost line, and determine the slope of each line.

c. Can the firm produce 248,000 units of output for exactly $336?

d. What is the minimum cost for which 248,000 units of output can be produced?

e. Suppose the firm is spending exactly $240 to make 248,000 units of output. If the marginal product of labor is 400 units of output, what must the marginal product of capital be?

4) The concept of equilibrium in the Roback model is sometimes called the 'spatial no arbitrage condition.' Explain what this means.

5) On a graph, show the effect of a decrease in crime in the Rosen-Roback mode. Explain in words and on the graph any shifts that happen.