

ECO 601-001
Fall 2004
Problem Set #8

Due: Wednesday, November 10

1. Arby's produces roast beef sandwiches according to the production function $q=10K^{.5}L^{.5}$, where q is the number of roast beef sandwiches per hour and K and L refer to inputs of capital and labor per hour.
 - a) During a normal lunch hour, 120 customers show up and order roast beef sandwiches. In an isoquant diagram, illustrate the different combinations of K and L that can be used to produce this output.
 - b) Suppose $w=6$ and $v=6$. What combination of L and K will minimize costs for $q=120$?
 - c) What is marginal cost if the firm uses this combination to produce $q=120$?

2. Suppose you own another Arby's on the other side of town. The same production function applies to this restaurant. When you built this restaurant, you anticipated that your desired output would be 80 sandwiches per hour, and so you selected $K=8$ for this restaurant. Now that you have built it, you are stuck in the short run with this amount of capital. Suppose that your *ex ante* forecast of demand turns out to be wrong, and that 120 customers per hour want to buy roast beef sandwiches at this restaurant.
 - a) Illustrate the short-run combination of K and L you would use to produce $q=120$, and then show the isocost line associate with this input combination. What is total cost?
 - b) Are you under or over-utilizing capital relative to labor? Explain by computing marginal products and using the optimality condition for cost minimization.
 - c) In a diagram, illustrate the LRAC curve for this restaurant, and show the SRAC curve associated with $K=8$. Briefly explain how your answer to (b) shows up in this diagram.

3. Consider a production function using two inputs, labor and capital:
 $Q = [L^{.5} + K^{.5}]^2$
Let $w = \$2$ and $v = \$1$.
 - a) The firm's desired output level is Q . Write an expression for the cost-minimizing quantity of L as a function of Q . Do the same for K .
 - b) Find the equation for the firm's long-run total and average cost curves.
 - c) How much labor should the firm employ to produce different outputs if capital is fixed at $K = 9$ in the short run?
 - d) Graph the firm's short-run (for $K = 9$) and long-run total cost curves.

4. TFUE: If $Q = f(L, K, M)$ and inputs L , K , and M have input prices w , v , and u , then the function $C = 3Q^{.5}w^{.5}v^{.5}u^{.5}$ is a well-behaved total cost function.