IN-CLASS ASSIGNMENT: Long-run Costs

Wednesday, April 1st, 2015

5 points

Name: ANSWER KEY

1. Let the production of a good be given by the production function $q = 5K^{0.5}L^{0.7}$. The cost per unit of capital, r, is \$200 and the cost per unit of labor, w, is \$12. Assume L is on the x-axis and K is on the y-axis.

   a. What is the MRTS?

$$MRTS = \frac{-MP_L}{MP_K} = -\frac{5(0.7)K^{0.5}L^{-0.3}}{5(0.5)K^{-0.5}L^{0.7}} = -\frac{7K}{5L}$$

   b. What is the input-price ratio?

$$\text{Input-price ratio (IPR)} = -\frac{w}{r} = -\frac{12}{200}$$

   c. What is the cost minimizing number of capital and labor when $q = 2000$?

$$MRTS = IPR$$

$$-\frac{7K}{5L} = -\frac{12}{200} \quad \text{or} \quad K = 0.043L$$

$$2000 = 5(0.043L)^{0.5}L^{0.7}$$

$$2000 = 1.04L^{1.2}; \quad (1923)^{1/1.2} = (L^{1.2})^{1/1.2}$$

$$L = 545$$

$$K = 23$$

   d. What is the minimum cost of producing $q = 2000$?

$$C = 200(23) + 12(545) = \$11,140$$