EC 311
Production and Costs
Winter 2024

1. Do the following production functions have increasing, decreasing, or constant returns to scale?
   a.) $F(K,L) = K^{.25}L^{.75}$
   b.) $F(K,L) = 10K^{.25}L^{.25}$
   c.) $F(K,L) = \frac{1}{4}K^{0.5}L^{0.5}$
   d.) $F(K,L) = 0.5\,K^2L^2$

2. What is the average product of labor for the following production functions?
   a.) $Y = F(K,L) = 4K^2L^4$
   b.) $Y = F(K,L) = K^{.25}L^{.75}$

3. For the following production function, find the cost function when the rental rate of capital is \$5 and the wage rate for labor is \$5. **Hint:** Find L* and K* first.

$$Q = F(K,L) = L^{\frac{1}{3}}K^{\frac{1}{3}}$$

4. Show that a quadratic cost function has increasing and linear marginal costs.

$$C(Q) = 3Q^2 + 35$$

5. Show that a cubic cost function will have an initial decreasing and eventual increasing marginal cost. For what range of Q is MC increasing? Decreasing?

$$C(Q) = 3Q^3 - 10Q^2 + 5Q + 10$$