ECO 601-001
Fall 2004
Problem Set #7

Due: Wednesday, November 3.

1. You own a company that produces plastic products. A major product is plastic drinking cups. The production function for these cups is given by $Q = 600K^2L^2 - K^3L^3$, where Q is output and K and L are capital and labor inputs, respectively.
    a) Derive expressions for MP_L and AP_L. Graph these functions for $K = 10$, emphasizing the critical points.
    b) Would you ever use the combination $K = 15$ and $L = 30$ to produce plastic cups?

2. Given the following two production functions:
$Q = 2K^{.5}L^{.5}$
$Q = (K^{.5} + L^{.5})^2$
    a) Calculate the $MRTS_{L,K}$ for each.
    b) Graph isoquants corresponding to $Q = 4$ and $Q = 8$ for each.

3. What if the production function for secondary education (E) is: $E = .5T^{.7}B^{.4}$, where T is teachers and B is buildings and materials.
    a) Find the marginal product of T and the marginal product of B.
    b) Does the production function exhibit diminishing marginal productivity of inputs? Explain.
    c) What is the marginal rate of technical substitution for this production function? Is the function homothetic?
    d) Does the production function exhibit diminishing MRTS? Explain.
    e) Find the output elasticity of education with respect to teachers.
    f) What returns to scale does this production function exhibit? Tell a short story why the production might exhibit these returns to scale.

4. Write out the translog production function when there is only one output, Q, and only two inputs, L and K.
    a) Show that this function reduces to the Cobb-Douglas when the conditions on p. 210 are met.
    b) Show that the function exhibits constant returns to scale only if the conditions on p. 210 are met.