ECO 401-002, 003
Spring 2013
Problem Set #4

Due: Wednesday, March 6

1. Labor and capital are used to produce widgets according to the production table below:

	Labor Input					
Capital Input		**1**	**2**	**3**	**4**	**5**
	1	20	40	55	65	75
	2	40	60	75	85	90
	3	55	75	90	100	105
	4	65	85	100	110	115
	5	75	90	105	115	120

   a) Draw the TP_L and the corresponding AP_L and MP_L curves when K is fixed at 2 in the short run.
   b) Is this production process subject to the law of eventually diminishing marginal returns? Pick a set of combinations of inputs to illustrate and explain your answer.
   c) Draw two points on the Q=40 isoquant, four points on the Q=75 isoquant, three points on the Q=90 isoquant, and two points on the Q=115 isoquant.
   d) Calculate the $MRTS_{L,K}$ along the Q=75 isoquant. Show that it is diminishing.
   e) Does this production exhibit increasing, constant, or decreasing returns to scale? Pick a set of combinations of inputs to illustrate and explain your answer. (Hint: start with K=1 and L=1, and then double all inputs. Then double all inputs again, and see what happens to Q.)

2. The production function for a firm that produces pizzas is $Q = 15K^{1/4}L^{3/4}$. Q is the number of pizzas produced per hour, K is the number of pizza ovens, and L is the number of workers. In the short run K is fixed at 3.
   a) Write an equation for the firm's short-run production function showing output as a function of labor when K is equal to 3.
   b) Calculate total output per hour when L = 0, 1, 2, 3, 4, and 5.
   c) Calculate MP_L for L = 1 to L = 5. Is MP_L diminishing?
   d) Calculate AP_L for L = 1 to L = 5.
   e) Graph TP_L. In a separate diagram, graph AP_L and MP_L.
   f) Does this firm experience decreasing, constant, or increasing returns to scale? Hint: set K=3 and L=3, and calculate Q. Then double both K and L, and show what happens to output.

3. Refer to Figure 7.3 in the text. Calculate and graph TP_L, AP_L, and MP_L when K is fixed at K=3.