

## COMM 220 – PRACTICE PROBLEM SET 2

1. The production function for widgets is  $Q = f(K,L) = 6L^{1/2} + 3K^{2/3}$ .
  - (a) What type of returns to scale does this production function display? Explain.
  - (b) If  $K=8$ , what is the average product of labour?
  - (c) If  $K=8$ , what is the short-run marginal product of labour?
  
2. Suppose a firm currently has 20 machines available for its production process. Output per person-hour when 20 machines are used is described by the function:
$$Q = -80 + 20L - 0.05L^2$$
  - (a) Find the  $MP_L$  and  $AP_L$  functions.
  - (b) At what level of labour input does the  $AP_L$  curve reach its maximum? What is the  $MP_L$  at this input level?
  
3. A firm has a production function for its output:  $Q = 250K^{0.75}L^{0.5}$ , where  $q$  = the number of products produced per week,  $K$  = hours of machine time, and  $L$  = hours of labour input.
  - (a) Write the expression for the firm's marginal rate of technical substitution of labour for capital.
  - (b) Does this production function exhibit increasing, constant, or decreasing returns to scale? Explain.
  - (c) What happens to the marginal product of each individual factor as that factor is increased and the other factor held constant?
  - (d) Assume that capital is limited to 100 machine hours, show that the marginal product of labour is decreasing.