

EC 501: Problem Set 5
(Due in class on Tuesday, October 8)

1. The Widget Co. can produce widgets according to the formula:

$$q = 5K^{3/4} L^{1/4}$$

where q is the output of widgets, and K , L are the quantities of capital and labor used.

- (a) Are there constant, increasing or decreasing returns to scale in widget production? Explain.
- (b) Are there constant, increasing or decreasing marginal products of factors? Explain.
- (c) In the short run, the amount of capital used by the Widget Co. is fixed. Derive the short-run cost function. (Note that the short-run cost function will show C as a function of q , K and the factor prices, w and r .)
- (d) Using your answer to (c), derive the long-run cost function.
2. Widget Corp.'s production function is given by

$$q = 3K + 2L.$$

- (a) Does Widget Corp. face constant, increasing or decreasing returns to scale?
- (b) Find Widget Corp.'s short-run supply curve and long-run MC curve.
- (c) If, in the short run, there are a total of 100 firms in the widget industry, all of which look just like Widget Corp., and which behave as price-takers, what is the short run supply curve of widgets? What is the long-run supply curve of widgets? Draw graphs to illustrate your answers.
3. Suppose that a firm's production function is given by

$$q = \min(5K, 10L)$$

and that the rental rates for capital and labor are given by $r=1$ and $w=3$.

- (a) Calculate the firm's long-run total, average and marginal cost curves.
- (b) Suppose that K is fixed at 10 in the short run. Calculate the firm's short-run total, average and marginal cost curves.