

Homework 6

Due: Monday, December 5, in lecture

1. [50] The cost function facing a firm is given by $C(y) = 5y^2 + 25$.
 - (a) [8] Verify that the marginal cost curve crosses the average cost curve at the minimum of the average cost curve. *Show work.*
 - (b) [16] Graphically illustrate the average cost curve, the average variable cost curve, the average fixed cost curve, and the marginal cost curve on the same graph. *Make sure it is very precise, and label all axis.*
 - (c) [6] Use a different color pen, graphically illustrate the firm's supply curve on the graph in part (b).
 - (d) [4] Will this firm ever chose to shut down? Explain.
 - (e) [8] Suppose the market price for output is $p = \$50$. What's the firm's profit?
 - (f) [8] Suppose the market price for output is $p = \$50$. Calculate the producer's surplus.

2. [50] A firm uses technology represented by the following production function: $f(x_1, x_2) = [\text{Min}\{x_1, 2x_2\}]^{\frac{1}{2}}$. Let $x_1 =$ (labor) and $x_2 =$ (raw materials), $y =$ (output), and (p, w_1, w_2) denote the price of output, price of labor, and the price of input 2, respectively.
 - (a) [12] If the firm wishes to produce (\bar{y}) units of output in the least costly way, how many units of labor and how many units of raw materials would it chose to use?
 - (b) [8] State the firm's minimum cost function, $C(w_1, w_2, \bar{y})$.
 - (c) [7] If $w_1 = w_2 = 1$, derive the firm's marginal cost function as a function of output, $MC(y)$.
 - (d) [7] If $w_1 = w_2 = 1$, derive the firm's average cost function, $AC(y)$.
 - (e) [6] Derive the firm's supply function, $S(p)$.
 - (f) [10] If the market price for each unit of output is $p = 48$, and $w_1 = w_2 = 1$, how many units of the output will this firm produce? How much profit will this firm make?