## PROBLEM SET 7

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Questions marked (**T**,**F**,**U**) should be answered "True," "False," or "Uncertain," and your answer should be briefly justified. Note that points will be awarded based only on your reasoning, not on the answer itself, even if correct.

- (1) (**T**,**F**,**U**) In a free market economy, a productively efficient firm always produce at the lowest point of its short run average cost curve.
- (2) Suppose that Joe, a lettuce farmer, has the following production function

$$q(Z_1, Z_2) = .5ln(Z_1) + .5ln(Z_2)$$

where q is the amount of lettuce produced, and  $Z_1$  and  $Z_2$  are the factors of production, which are hired by Joe at the given wages  $w_1$  and  $w_2$ . The lettuce is sold at a given price, P.

- a) Assuming that Joe's objective is to maximize profits, find the optimal quantities of  $Z_1^*$  and  $Z_2^*$  that should be used in the production of lettuce. Express both  $Z_1^*$  and  $Z_2^*$  as functions of  $w_1$ ,  $w_2$  and P.
- b) Use the results obtained in the previous question to find the profit function  $\pi(w_1, w_2, P)$ .
- c) Derive the supply function  $S(w_1, w_2, P)$ .
- d) Show that  $\frac{\partial \pi(w_1, w_2, P)}{\partial P} = S(w_1, w_2, P).$ e) Show that  $\frac{\partial \pi(w_1, w_2, P)}{\partial w_i} = -Z_i(w_1, w_2, P)$  for i = 1, 2.
- f) What is the slope of the supply function? How does it depend on the w's?
- g) Is the profit function  $\pi(w_1, w_2, P)$  convex or concave in P?
- (3) Now assume that the current price is P = \$20 and  $w_1 = \$2$  and  $w_2 = \$2.$ 
  - a) Below what price does supply equal zero? Interpret.
  - b) Suppose that for some particular reasons the price of lettuce is expected to become somewhat volatile during the next period. Some experts say there is a 50% chance that the

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price of lettuce could go up to \$30, and there is a 50% chance that the price could go down as far as \$10.

As a response to this situation, the government has decided to introduce a stabilization program under which they guarantee a stable price of \$20. Would Joe be better off under this stabilization policy than under volatile prices? What situation do you prefer? Explain. (Hint: Look at your answer to part 1g)

c) Now assume that prices are stable at \$4 but that the government wants to institute a price floor to support farmers. The new price is set at \$8. What is the dead weight loss of this policy?