Microeconomics. Problem set 3. Due date: tutorials till Jan, 11th.

Problem 1 (1p) *A computer company's cost function which relates its AC to the cumulative output Q and its current plant size q (between 10k - 50k of computers) is given by: $AC = 10 - 0.1Q + 0.3q$.*

- *are there economies/diseconomies of scale?*

- *is there a learning curve effect?*

- *during its existence the firm has produced a total of 40000 computers and is producing 10000 this year. Next year it plans to increase production to 12000. Will its average costs increase/decrease? Explain.*

Problem 2 (2p) *The data in the following table give information about the price for which a firm can sell a unit of output and total costs of production.*

		R		π	MC	MR	R	MR	π
q	P	$P=60$	C	$P=60$	$P=60$	$P=60$	$P=50$	$P=50$	$P=50$
0	60		100						
1	60		150						
2	60		178						
3	60		198						
4	60		212						
5	60		230						
6	60		250						
7	60		272						
8	60		310						
9	60		355						
10	60		410						
11	60		475						

- *Fill in the blanks.*

- *Show what happens to the firms's output choice and profit if the price of the products falls from 60 to 50.*

- *What happens to the firm's output choice and profit if the fixed costs increase to 150 and then to 200. Assume that the price stays at 60.*

- *Derive the firm's short-run supply curve.*

- *If 100 identical firms are in the market, what is the industry supply curve?*

Problem 3 (2p) *A firm owns two production plants that make widgets. The plant produce identical products and each plant (i) has a production function $F(K_i, L_i) = \sqrt{K_i L_i}$. The plants differ, however, in the amount of capital in place in the short run. In particular plan 1 has $K_1 = 25$ while $K_2 = 100$. Input prices are $w = r = 1$.*

- *Suppose production manager is told to minimize the short run total costs of producing Q. While Q is exogenous the manager can choose how much to produce at plant 1 and plant 2 as long as $Q = Q_1 + Q_2$. What percentage of its production should be produced at each plant.*

- *When output os optimally allocated between the two plants, calculate the firm's short run total, average and marginal cost curves. What is the marginal cost of the 100th , 125th and 200th, widget?*

- *How should the entrepreneur allocate widget production between the plants in the long run? Find the firms long-run total, average and marginal cost curves.*

Problem 4 (2p) *The long run average cost curve is $AC(Q) = \sqrt{wr}(120 - 20Q + Q^2)$. The corresponding $MC(Q) = \sqrt{wr}(120 - 40Q + 3Q^2)$. The demand for labor of an individual firm is $L(Q, w, r) = \frac{\sqrt{r}(120Q - 20Q^2 + Q^3)}{2\sqrt{w}}$. The price of capital $r = 1$.*

- *In a long-run competitive equilibrium how much output will each firm produce.*

- *In a long-run competitive equilibrium what would be the market price (note, your answer will be expressed as a function of w)*

- *In a long-run competitive equilibrium how much labor would be employed (again, your answer will be expressed as a function of w)*

- *Suppose $D(P) = \frac{10000}{P}$. What is the market equilibrium quantity as a function of w.*

- *What is the long-run number of firms as a function of w.*

Problem 5 (1.5p) *Suppose that a competitive firm has a total costs function $TC(q) = 450 + 15q + 2q^2$ and marginal costs is $MC(q) = 15 + 4q$. If the market price is 115:*

- *find the level of output produced,*

- *find the level of profit,*

- *find the producer surplus.*

Problem 6 (1.5p) *Suppose you are given the following information about a particular industry: $D(P) = 6500 - 100P$, $S(P) = 1200P$, $TC(q) = 722 + \frac{q^2}{200}$, $MC(q) = \frac{q}{100}$. Assume that all firms are identical and market is perfectly competitive.*

- *find the equilibrium price, equilibrium quantity, the output supplied by the firm and the profit of each firm.*

- *would you expect to see entry/exit to/from the industry in the long run? Explain. What effects will entry/exit have on the market equilibrium?*

- *what is the lowest price at which each firm would sell its product in the long run? Is profit positive/negative/zero at this price?*

- *what is the lowest price at which each firm would sell its product in the short run? Is profit positive/negative/zero at this price?*

Problem 7 (1p) *A sales tax of 1 per unit is placed on a firm whose products sell at 5 in a competitive market with many firms.*

- *how does this tax affect the cost curves?*

- *what will happen to the firm price, output, profit?*

- *will there be entry/exit to/from the industry?*

Problem 8 (1p) *A sales tax of 10% is placed on half of the firms (the polluters) in a competitive market. The revenue is paid to the remaining firms (the nonpolluters) as a 10% subsidy on the value of output sold.*

- *assuming that all firms have identical constant long-run average costs before the sales tax-subsidy policy, what do you expect to happen in the short and long run to the price of the product, firm's output and industry output?*

- *can such a policy always be achieved with a balanced budget (tax revenues=tax subsidy payments)? Explain.*