

Microeconomics. Problem set 3 (group 3). Due date: Tutorials on Dec, 14th.

Problem 1 (3p) A firm owns two production plants that make widgets. The plants 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 plant 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. [1p]
- When output is 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? [1p]
- How should the entrepreneur allocate widget production between the plants in the long run? Find the firm's long-run total, average and marginal cost curves. [1p]

Problem 2 (1.5p) A company has $TC(Q) = 3Q^3 - 120Q^2 + 12000Q$ with $MC = 9Q^2 - 240Q + 12000$.

- Determine the long run supply curve [1p]
- Find the minimal price for which the company decides to produce in the long and short run. [0.5p]

Problem 3 (2p) Suppose you are given the following information about a particular company on a competitive market: $TR=17280$, $TC=19200$, $ATC=10$, $AVC=8.98$, $MC=9$:

- find the level of output produced, [0.5p]
- find the price level, [0.5p]
- find the company's profit. [0.5p]
- should this company continue its production? [0.5p]

Problem 4 (2.5p) 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. [0.5p]
- In a long-run competitive equilibrium what would be the market price (note, your answer will be expressed as a function of w) [0.5p]
- In a long-run competitive equilibrium how much labor would be employed (again, your answer will be expressed as a function of w) [0.5p]
- Suppose $D(P) = \frac{10000}{P}$. What is the market equilibrium quantity as a function of w . [0.5p]
- What is the long-run number of firms as a function of w . [0.5p]

Problem 5 (3p) The market demand for sorghum is given by $Q_D = 500 - 10P$ while supply $Q_S = 40P$. The government would like to increase the income of farmers and is considering two alternative interventions: acreage limitation program and government purchase program.

- What is the equilibrium in the absence of intervention? [0.5p]
- The government goal is to increase the price to \$15 per unit. How much would be demanded / supplied at this price? How much the government needs to pay farmers to voluntarily restrict their output to the level demanded at price \$15. [1p]
- Fill in the table [1.5p]

	<i>With no program</i>	<i>With acreage limitation program</i>	<i>Impact of the program</i>
<i>consumer surplus</i>			
<i>producer surplus</i>			
<i>impact on the government budget</i>			
<i>net benefits (consumer surplus+producer surplus-government expenditures)</i>			
<i>deadweight loss</i>			