Assignment 3
Due July 3rd in the beginning of class

TRUE/FALSE/UNCERTAIN. 5 points each, all marks are given for your explanation.

a) Fixed proportions technology $y = min\{x_1, x_2\}$ and perfect substitutes technology $y = x_1 + x_2$ must have constant average costs. *(Hint: you **do not** need to derive the total and average costs in order to answer this question)*

b) If marginal products of all inputs are diminishing, then the technology must exhibit decreasing returns to scale.

Problem 1. (10 points) A firm has production function $f(x_1, x_2) = x_1^{\frac{1}{4}} x_2^{\frac{1}{2}}$, input prices are $w_1 = 10$, $w_2 = 5$.

a) Derive firm's short-run total cost function if in short-run x_2 is fixed at $\bar{x}_2 = 9$. (3 points)

b) Find firm's unconditional factor demands and the firm's total cost as a function of output in the long run. (4 points)

c) What combination of capital and labor will minimize total cost of producing 16 units of output if both factor are variable? Show your solution on a diagram. (3 points)

Problem 2. (10 points) A firm has production function $f(x_1, x_2) = x_1^{\frac{1}{4}} x_2^{\frac{1}{2}}$, input prices are $w_1 = 10$, $w_2 = 5$ and the firm sells its output in the market for 360 dollars/unit.

a) Find how much of the first input the firm will derive in the short-run; fin's firm's output and calculate profits. (4 points)

b) Find the combination of inputs that will maximize the firm's profits in the long run; find the firm's output and calculate profits. (6 points)

Problem 3. (10 points)
Consider a competitive industry. Inverse market demand is given by $P^D = 100 - .15Q^D$.

a) In short-run there are 10 identical firms with $TC = .25y^2 - y + 100$. Find: short-run supply curve for each firm, market supply, short-run equilibrium price and quantity, individual quantity produced by each firm. Show your results on a diagram. (5 points)

b) Suppose that in the long-run the costs in this industry are $TC = 2y^2 - 38y + 288$. Find long-run equilibrium market price, quantity, number of firms and output produced by each firm. Show your results on a diagram. (5 points)