EC 313 Spring 2000 Problem Set 2

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Due Thursday 2 March 2000 at classtime

Produce a Mathematica notebook containing the answers to these questions, label it with your name, and email it (as an email attachment) to baum@bc.edu to submit your problem set. If you have any questions, please send me email.

1. Consider a profit-maximizing firm that produces units of good x with the technology f(x) = sqrt(x) and faces costs that are proportional to x. Define the profit function for the firm as a function of x, p (the price of output) and w (the cost per unit of output). For p=w=1, plot profits over the unit interval.

2. Analytically solve for the profit-maximizing level of output, as a function of arbitrary levels of p and w, by differentiating the profit function with respect to x (hint: see *D[]*) and solving the resulting first order condition for x (hint: *Solve[]*). The result should be a rule.

3. Substitute the profit-maximizing level of output (call it xhat) into the profit function to express profit as a function of p and w. Hint: use the *'/.'* postfix operator.

4. Modify the profit function to contain a fixed cost term, k. Demonstrate that the profit maximizing level of output (per #2) is invariant to the level of k.

5. Now consider a Cobb-Douglas production function where output is related to two factors, x1 and x2, via f(x) = x1^(1/4) x2^(1/4). Define the profit function for this firm, where output sells for p and costs are linear in the two factors with factor prices w1 and w2, respectively. Use *ContourPlot* to generate isoprofit contours for p=20, w1=2, w2=1 over the range {x1,0.01,80}, {x2,0.01,80}.

6. Analytically solve for the profit-maximizing level of output, as a function of arbitrary levels of p, w1, and w2, by differentiating the profit function with respect to each factor input. The result will be two equations in two unknowns (x1,x2), which should then be Solved.

7. Evaluate this solution to calculate the profit-maximizing level of output for p=20, w1=2, w2=1, and evaluate the level of profit that will be generated at that output level.