Economy essay

? Microeconomics Homework Problem 1: C(Q) = 100 + 20Q + 15Q^2 + 10Q^3) Fixed Cost (doesn't change depending on output produced) = 100 b) Variable Cost of producing Q = 10 units: 20*10 + 15*10^2 + 10*10^3 = 200 + 1, 500 + 10, 000 = 11, 700 c) Total Cost of producing Q = 10 units: C(10) = 100 + 20*10 + 15*10^2 + 10*10^3 = 11, 800 Alternatively, we have Total Costs of Producing Q= 10 units = Fixed Costs + Variable Costs of producing Q = 10 units = 100 + 11, 700 = 11, 800 d) Average Fixed Cost = Total Fixed Costs / Output = 100/10 = 10 e) Average Variable Cost = Total Variable Costs of producing Q= 10 units / Output = 11, 700/10 = 1, 170 f) Average Total Cost = Total Costs of producing Q= 10 units / Output = 11, 800/10 = 1, 180 g) The marginal cost function is the derivative of the Total Short Run Cost Function. Thus MC(Q) for this cost function = 20 + 30Q + 30Q^2.

At Q = 10, Marginal Cost = 20 + 300 + 3000 = 3320 Problem 2:(From Spencer: I think this problem is complete but don't have my book on me. I will check when I get home tonight and if it isn't I'll finish it…) Q FC VC TC AFC AVC ATC MC 0 $15, 000 $15, 000 $- 100 $15, 000 $15, 000 $30, 000 $150 $150 $300 $150 200 $15, 000 $25, 000 $40, 000 $75 $125 $200 $100 300 $15, 000 $37, 500 $52, 500 $50 $125 $175 $125 400 $15, 000 $75, 000 $90, 000 $37. 50 $188 $225 $375 500 $15, 000 $147, 500 $162, 500 $30 $295 $325 $725 600 $15, 000 $225, 000 $240, 000 $25 $375 $400 $775 Problem 3: a. C(Q1, Q2) = 90 – 0. 5Q1Q2 +0. 4Q1^2 + 0. 3Q2^2 C(Q1, 0) = 90 + 0. 4Q1^2 C(0, Q2) = 90 + 0. 3Q2^2

For Q1 = 10, Q2 = 10: C(Q1, Q2) = C(10, 10) = 90 – 0. 5*10*10 + 0. 4*10^2 + 0. 3*10^2 = 90 – 50 + 40 + 30 = 110 C(Q1, 0) = C(10, 0) = 90 – 0.

5*10*0 + 0. 4*10^2 + 0. 3*0 = 90 + 40 = 130 C(0, Q2) = C(0, 10) = 90 – 0. 5*0*10 + 0. 4*0 + 0. 3*10^2 = 90 + 30 = 120 Since C(Q1, 0) + C(0, Q2) = 250 > C(Q1, Q2) = 110, Economies of Scope does exist. b. Cost complementarities exist in a multi-product cost function when the marginal cost of producing one output is reduced when the output of another product is increased. Differentiating the cost function with respect to Q2: MC2(Q1, Q2) = -0. 5Q1 + 0. 6Q2 With respect to Q1: MC1(Q1, Q2)= -0. 5Q2 + 0. 8Q1

Clearly, cost complementarities exist. If we increase the quantity of product 1 being produced, the marginal cost of producing product 2 decreases. Additionally, the marginal cost of producing product 1 is a decreasing function of product 2. Thus, the two products are cost complementary. c. The marginal cost of producing product 1 is given by the following: MC1(Q1, Q2) = -0. 5*Q2 + 0. 8*Q1 If the firm sells the division, the marginal cost function becomes: MC1(Q1, 0) = 0. 8*Q1 Thus, due to the sale of the division, the marginal cost of producing product 1 goes up by . 5 times the number of units of Q2 that were being produced prior to the sale. d.

Cost complementarity: a0 Looking at the two conditions, it is clear that if a Q = 10 P= 9-10/4=$6. 50 Profits= P*Q – C(Q) = 6. 5*10 – (124-16*10 + 10^2) = 1 Additional firms will enter the market to capture economic profits. In the equilibrium condition under monopolistic competition, economic profits will be zero. Problem 7: The inverse market demand function is P = 200 – 3(Q1 + Q2) This is of the form P = a – b(Q1 + Q2) We see that a = 200; b = 3 The Cost function for firm 1 => C1(Q1) = 26Q1 => Marginal Cost = 26 The Cost function for firm 2 => C2(Q2) = 32Q2 => Marginal cost = 32 (a) Firm 1’s Marginal Revenue function = 200 – 3Q2 – 6Q1

Firm 2’s Marginal Revenue function = 200 – 3Q2 – 6Q2 Both firms will produce to maximise their profits. Hence, they will produce such that Marginal Revenue = Marginal Cost and this will give us the reaction functions Therefore, we get the reaction functions as follows: Firm 1’s Reaction Function: Q1 = [(200-26)/6] – Q2/2 = 29 – Q2/2 Firm 2’s Reaction Function: Q2 = [(200-32)/6] – Q1/2 = 28 – Q1/2 (b)Solving these two equations we get the equilibrium output for both firms Q1* = 20 Q2* = 18 Hence, according to the Cournot model, firm 1 will produce more than firm 2. (c) The inverse demand function will give us the equilibrium price by inputting the equilibrium output P* = 200 – 3(Q1* + Q2*)

P* = 200 – 3(18 + 20) = 86 P* = 86 (d) Profit = Revenue – Cost = P x Q – C(Q) Firm 1’s Profit = 86*20 – 26*20 = $1200 Firm 2’s Profit = 86*18 – 54*18 = $972 Hence, according to the Cournot model, firm 1 will produce more than firm 2 resulting in a profit greater than that earned by firm 2. Problem 8:- Cournot Model:- The Inverse Demand function is as follows: P = 600 – 3Q1 – 3Q2 c1 = c2 = 300 = marginal cost of both firms Comparing the inverse demand function to the P = a – b(Q1 + Q2) form we get, a = 600 ; b = 3 We arrive at the equilibrium output using the reaction functions for both firms which we get by equating the firm’s Marginal Revenue to Marginal Cost o maximise profits:- Firm 1’s Reaction Function: Q1 = (a – c1)/2b – Q2/2 Q1 = 300/6 – Q2/2 = 50 – Q2/2 Also, Firm 2’s Reaction Function: Q2 = (a – c2)/2b – Q1/2 > Q2 = 50 – Q1/2 Solving both equations, Q1 = Q2 = 100/3 = 33. 33 Price = 600 – 100 – 100 = 400 Firm 1’s profit – P*Q1 – C*Q1 = 400*100/3 – 300*100/3 = 10, 000/3 = $3, 333. 33 Firm 2’s profit – P*Q2 – C*Q2 = 400*100/3 – 300*100/3 = 10, 000/3 = $3, 333. 33 Stackelberg Model:- In the

Stackelberg Model, one firm acts as the leader and commits to an output before all other firms. The other firms then react to this output to reach an output to maximise their profits via the reaction function. The equations are stated below. Assume Firm 1 is the leader.

Q1 = (a + c2 -2c1)/2b = 300/6 = 50 Q2 = (a – c2)/2b – Q1/2 = 50 – 50/2 = 25 Here we see that Firm 1 being the leader has an output of 50 which the other firm follows and reaches equilibrium by producing a much lesser output of 25 Price = 600 – 150 – 75 = 375 Profit_1stFirm = (P – c1)*Q1 = 75*50 = $3750 Profit_2ndFirm = (P – c2)*Q2 = 75*25 = $1875 Firm 1 makes a profit much greater than that of firm 2 in the stackelberg model! The output and profits of firm 1 by this model are greater than that of firm 1 by the cournot model. This is so, because by moving in first, firm 1 is able to capture a larger market share and hence a greater profit! Bertrand Model:-

Due to a price war, both the firms keep undercutting and this results in a situation such that the equilibrium price settles down at a level equal to the Marginal Cost of the product. Therefore P = 600 – 3Q1 – 3Q2 = MC = 300 3(Q1 + Q2) = 300 Q1 + Q2 = 100 Assuming that the market is equally distributed, Q1= Q2 Hence, Q1 = Q2 = 50 Due to the price war which leads to low prices, the demand increases, causing firms to produce more than that in the cournot model and the Stackelberg Model. Firm 1’s Profit = P*Q1 – C1*Q1 = 300*50 – 300*50 = 0 Firm 2’s Profit = P*Q2 – C2*Q2 = 300*50 – 300*50 = 0 Hence, due to the price war, both firms operate at zero profits at equilibrium.

Problem 9: Case 1 (without fixed investment): This case will be similar to the Cournot model. hence, we can calculate Taurus Technologies' profit using that model. Inverse Market demand function => P = 160 – 2(Q1 + Q2) a = 160 and b = 2 Marginal Cost of the firms = C1 = C2 = 4 Using the Cournot Model, we get the reaction functions: Taurus Technologies' Reaction Function: Q1 = (a – c1)/2b – Q2/2 Q1 = 156/4 – Q2/2 = 39 – Q2/2 Also, Spyder Technologies' Reaction Function: Q2 = (a – c2)/2b – Q1/2 Q2 = 156/4 – Q1/2 = 39 – Q1/2 Solving the two reaction functions, we get the equilibrium outputs: Q1* = 26 Q2* = 26 Equilibrium Price = P* = 160 – 2(52) = 56

Profit for Taurus Technologies = P*xQ1* – C1xQ1* = 56*26 – 4*26 = $1352 Case 2 (with fixed investment): For this case, Taurus Technology will be a first mover. Hence, it will be fair to calculate profits and equilibrium outputs using the Stackelberg model. The Outputs for this model are defined as follows: Q1 = (a + c2 -2c1)/2b = 156/4 = 39 Q2 = (a – c2)/2b – Q1/2 = 39 – 39/2 = 19. 5 Equilibrium Price = P* = 160 – 2(39+19. 5) = 43 Profit for Taurus Technologies = P*xQ1* – C1xQ1* – Fixed Investment = 43*39 – 4*39 – 200 = $1321 Hence we see that the profit in the case with the fixed investment is lesser than that in the case without fixed investment. Hence, Taurus Technologies should not make the investment.