Economics 100A **Daniel McFadden**
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Answers: Problem Set 9

1. a) P =MC, so
   4 +2q = P, and
   q = (P-4)/2 is the supply of each of these firms.

   b) Industry supply = 10*supply of each firm, so Industry supply = Q = 10q = 5*(P -4).

   c) Supply = Demand, so P = 100 - Q = 100 - (5(P - 4)), and solving for p you will get that P = $20. Now plug this P in the demand or supply to get Q = 80. This is the total amount produced. Since there are 10 equal firms, each produce q = Q/10 = 8 units.

   d) profit = revenue - costs = 20*8 -(10 + 4*8 + 64) =$54.

   e) It's the short-run, since profits are different from zero.

2. a) MR = 24 - 2Q.

   b) MR = MC, so 24 -2Q =2Q and then Q = 6. Now plug this Q in the demand curve to get P = $18.

   c) profit = 18*6 -(36 +12) = $60.

   d) CS = ½ (6*6) = $18
   PS = 36 + 36 = $72
   DWL = 2*6/2 = $6

   (The best way to figure out these values is to draw a graph. Try it!)

3. The tax here will affect the MC and then the quantity produced and the price charged. So, MCafter tax = MC before tax + $8. And then, MCafter tax = 2Q + 8 = 24 -2Q = MR. Solving you will get Q = 4 and P = $20. A graph will help you to see that the tax will reduce the CS and PS and will produce a tax revenue to the government of $32 = $8 * 4. Finally, the DWL will increase as we move further from the "competitive" equilibrium. Also, the consumer will pay only part of the tax. Notice that the new price

is $20. And the price before tax was $18. So, consumers only pay 2/8 of the tax. The monopolist pays the rest.

4. A tax on profits does not change the quantity nor the price chosen by the monopolist since profit after tax = (1 -t) * profit before tax = (1 - t)*(revenue - costs), where t is the tax rate on the profits. Well, this tax will not change the quantity chosen by the monopolist (Why?) and as a consequence will not change the price. We have the same surplus and the same deadweight loss as in 2. The difference is that part of the producer surplus now goes to the government in the form of taxes.

5. (Assume that fixed cost = 0. This problem is, mathematically speaking, harder than the ones that you will see in your quiz. Sorry).
   a. P = MC, so 100 - Q = 2Q, or Q = 100/3. And the price of the last unit is then P = $(2/3)*100. Remember that here we have an infinite number of prices, since we are dealing with perfect price discrimination.

   b. profit = revenue - costs = $2* (100/3)^2 - (100/3)^2$, where I use the fact that if MC = 2Q, then Cost = Q^2. This is a fact about integration. (Don't worry, we will not ask you to calculate integrals. Just be sure that you understand the logic of the problem and try, as practice, to redo the exercise if Cost = 2Q).

   c. CS = 0, PS = (100/3)*(100/2) =1,665, and the DWL = 0 since it's a perfect discriminator.(Again, draw the MC and MR and check that you understand how to calculate PS).

6. $MR_1 = 100 - 2Q_1 = MC = 30$, so $Q_1 = 35$ and P =$65, and $profit_1 = 35^2 = \$1,225$.
   $MR_2 = 120 - 4Q_2 = MC = 30$, so $Q_2 = 45/2$ and P =$75, and $profit_2 = 45^2/2 = \$1,012.5$. The hardest part is to figure out what is the demand and the MR if the firm decides to consider/treat these markets as one big market and charge one price. The best way to see how to derive the market demand is to plot the two demand curves and add them as we did when we studied consumer theory. The market demand will have a kink (Check it!). The expression for the market demand is the following:

   $P = 120 - 2Q$ if $0 \leq Q \leq 10$
   $P = 2/3*(160 - Q)$, if $Q \geq 10$.

   That implies that the MR is equal to:

   $MR = 120 - 4Q$, if $0 \leq Q \leq 10$
   $MR = 320/3 - 4/3*Q$, if $Q \geq 10$.

Now, we only need to equate MR to MC = $30. We do then 320/3 -4/3*Q =30 (Why this MR segment? What is the minimum value of MR, if Q≤10?), and get that Q = 230/4 and P = $205/3. The profit then is equal to (205/3 -30) *230/4 = $2,204.17. So it's more

profitable to consider these two markets separately than to treat them as a one big market. Price discrimination rules!