

Problem Set #7
 PPA 723
 Professor John McPeak
 Due Monday

Name: answer key

1) Complete the following table.

a) Quantity of Output	Fixed Cost	Total Cost	Average Cost	Marginal Cost (from lower to higher q, listed with higher q)	Variable Cost	Average Variable Cost
0	5	5	-----	-----	-----	-----
1	5	23	23	18	18	18
2	5	40	20	17	35	17.5
3	5	56	18.7	16	51	17
4	5	71	17.8	15	66	16.5
5	5	87	17.4	16	82	16.4
6	5	104	17.3	17	99	16.5
7	5	122	17.4	18	117	16.7
8	5	142	17.8	20	137	17.1

b. If the market price for the output produced is 17 and the market structure is competitive, what level of output is the profit maximizing level of output? Why?

MR=MC. If MR=p, then MR =17. MC equals 17 at two different points: an output of 2 and an output of 6. If I choose an output of 2, then I am earning revenue of $2 \cdot 17$ and producing at a cost of 40, or a negative profit of -6. Bad news, since I could shut down and earn -5. Try the other point- $6 \cdot 17 - 104$. Still negative profit (-2), but better than -5 if I produce nothing and eat all the fixed cost. Alternatively, $P > AVC$ at $Q=6$, so better off than $Q=0$.

2) You know that the inverse demand curve is defined by the following function: $P=25-Q$ and costs are defined by $5*Q$ (so you know MC is 5 for all possible levels of Q).

a. What is the equilibrium price quantity pair if the market is competitive?

Supply is defined by the MC curve, demand is given. $S=D$, so $MC=25-Q$, or $5=25-Q$, which implies $Q=20$. A Q of 20 plugged back into the demand curve gives us a price of 5.

(P,Q) is (5, 20).

b. What is the size of consumer surplus if the market is perfectly competitive?

Consumer surplus is the area below the demand curve and above the price line. Demand curve hits the y-axis at 25. Price is 5. Difference is 20 (first triangle side). The base of our triangle is defined by the quantity sold (from zero up to 20). $\frac{1}{2}$ base time height, or $.5*20*20=200$.

c. What is the size of producer surplus if the market is perfectly competitive?

Producer surplus is the area above the supply curve and below the price line. In this case, there is no such area, so $PS=0$. $S=MC=5$, so a perfectly horizontal supply curve.

d. Use the bisection rule to define the marginal revenue curve.

By the bisection rule, $MR=25-2*Q$.

If you like, $R=P*Q$. If you sub in $P=25-Q$ for P, you arrive at $R=(25-Q)*Q$. If you multiply through, $R=25*Q-Q*Q$. If you take the derivative with respect to Q, this leads to the result, $MR=25-2*Q$.

Just stating the result due to the rule is fine and sufficient here.

e. What level should the monopolist produce at?

Where marginal revenue equals marginal cost, so where $25-2*Q=5$, or $Q=10$.

f. What is the implied price?

$P=25-Q$, so if $Q=10$, then $P=15$.

g. What is the implied profit?

Profit = $P*Q$ - Cost (Q).

Here $P=15$, $Q=10$, $C(Q)=5*Q$.

Profit = $15*10-5*10$, or $150-50=100$.

h. What is the size of producer surplus for the monopolist?

Area below the price line and above the supply curve, bounded below by a quantity of zero and above by a quantity of the monopolist's choice. That is to say:

$(15-5)*(10-0)$ or 100.

i. What is the size of consumer surplus for the monopoly setting?

Area above the price line and below the demand curve, bounded on one side by $Q=0$ and the other by the monopolist's choice of Q . That is to say:

$1/2*(25-15)*(10-0)=50$.

j. Compare the implications for social welfare for the perfectly competitive market with the monopoly market structure. Which leads to greater total social welfare?

Perfectly competitive market gives a total welfare of $CS+PS=200$. Monopoly market structure gives a total welfare of $CS+PS=150$. Monopoly market structure leads to lower social welfare.

3) Illustrate the concept of deadweight loss by graphing the impact of a policy that limits the amount that can be sold in the market to a level below the perfectly competitive market equilibrium quantity. Label areas to correspond to producer surplus, consumer surplus, and deadweight loss in your graph.

This is from the class notes, so I am not reproducing it here. There is ambiguity about where to draw the price line - it can be anywhere from the p that corresponds to where the vertical line at q_1 hits MC / supply curve up to the price that corresponds to where the vertical line hits the demand curve. These are the two dotted lines I drew in class. PS is below the price line, CS is above the price line where you draw it on the graph. DWL is the area from the vertical line at q_1 over to the perfect competition q^* under the demand curve and above the supply curve.