

**Econ 342: Environmental Economics**  
**Chapter 2**  
**In-Class Assignment**

Name: \_\_\_\_\_

Name: \_\_\_\_\_

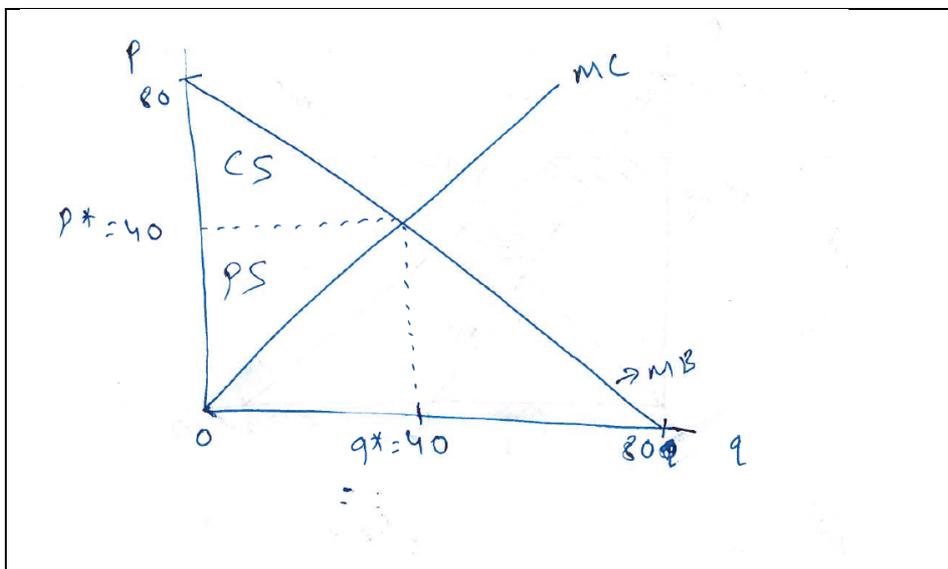
1. Suppose the market demand function (expressed in dollars) for a normal product is  $P = 80 - q$ , and the marginal cost (in dollars) of producing it is  $MC = 1q$ , where  $P$  is the price of the product and  $q$  is the quantity demanded and/or supplied.

a. How much would be supplied by a competitive market? Graph the demand and supply curves, and the equilibrium price and quantity. Label all the points. **[5 points]**

- Set Market demand = Market supply  
or,  $80 - 1q = 1q$ .  
or,  $80 = 2q$   
or,  $q = 40$

Plugging  $q = 40$  in the equation ( $P = 80 - q$ ) gives  $P = 40$ .

- Therefore, the competitive market equilibrium quantity supplied = 40 and equilibrium price = 40.



b. Compute the consumer surplus; producer surplus and the economic surplus. **[10 points]**

- Consumer surplus is the area of the triangle formed by the demand curve and the price line. The maximum price is \$80 and the equilibrium price is \$40. Thus, the height of the triangle is 40. The base of the triangle is the efficient units which, in this case is 40. Hence, the consumer surplus is given as:

- Consumer surplus (CS) =  $(1/2) \times (40) \times (40) = \$800$
  - Producer surplus is the area of the triangle formed by the supply curve and the price line. The minimum price is 0 and equilibrium price is \$40. Thus, the height of the triangle is 40. The base of the triangle is the efficient units which, in this case is 40. Hence, the producer surplus is given as:
    - Producer surplus (PS) = \$800.
  - Economic surplus = CS+PS = \$1600.
- c. Compute the consumer surplus assuming this same product was supplied by a monopoly. (*The marginal revenue in this case is  $MR = 80-2q$* ). Graphically represent the consumer surplus for the monopoly. **[10 points]**
- A monopolist produces a level of output as determined by the intersection of marginal revenue and marginal cost:

Marginal Revenue = Marginal Cost

$$80 - 2q = q$$

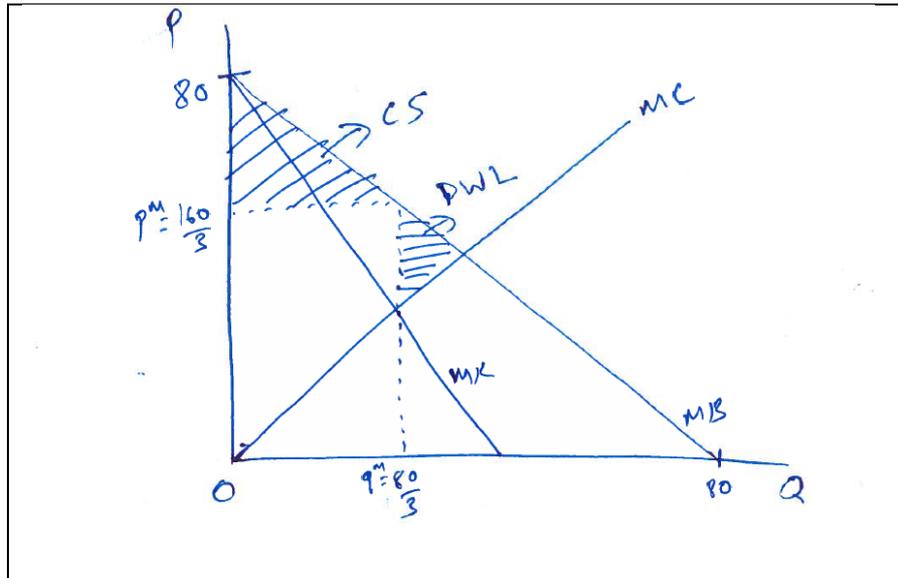
$$80 = 3q$$

$$\Rightarrow q = 80/3; p = 160/3$$

As mentioned, consumer surplus is the area of the triangle formed by the demand curve and the price line. The maximum price is \$80 and equilibrium price is \$160/3, Thus, the height of the triangle is difference of these two values. The base of the triangle is the efficient units which, in this case is 80/3, Hence, the consumer surplus is given as:

$$\begin{aligned} \text{Consumer surplus} &= \frac{1}{2} \times \left( 80 - \frac{160}{3} \right) \times \frac{80}{3} \\ &= \frac{1}{2} \times \frac{80}{3} \times \frac{80}{3} \\ &= \frac{3200}{9} \end{aligned}$$

Hence, the consumer surplus is \$3,200/9.



2. **The Coase Theorem:** here is a simple bargaining example.

There is a factory that is dumping toxic waste into a river where a resort is located downstream. At the moment, the factory is not filtering the water that it dumps into the river. There is a filter it could install that would remove a significant amount of the toxic elements from the water before it is dumped in the river. The factory and the resort have each assessed the situation and come up with the following data:

Gains to:	Factory with filter	Factory with no filter
Factory	\$700/day	\$800/day
Resort	\$250/day	\$100/day

- a. If the factory is given ownership of the river, what choice will it make? How much would the resort be willing to pay to get the factory to make another choice? Will the factory accept? [2 points]

The factory will make the choice to not filter the waste.

With no filter, the factory makes \$800/day.

With a filter, the factory makes \$700/day.

The factory can make more money by not using the filter.

- b. How much would the resort be willing to pay to get the factory to make another choice? Will the factory accept? [3 points]

The resort will make \$250/day if the factory filters the river.

The resort will make \$100/day if the factory does not filter the river.

If the resort pays the factory \$100 to filter, then they will still make  $\$250 - \$100 = \$150$ /day.

Therefore, the resort would be willing to pay up to \$100 to the factory. The resort would be

willing to pay this amount because, if there is no filter in the river, then they will make only \$100/day.

This offer would be acceptable to the factory because with a \$100 payment to have a filter, their earnings will be the same as if there was no filter in the river (i.e., they will still make \$800)