

MATH 134 – Calculus with Fundamentals 2
Discussion Day 1 – Consumer and Producer Surplus
February 6, 2018

Background

In a free market economy, the *demand curve* is the graph of the function D that represents the relationship between the demand for a quantity and its price. It is traditional in economics to think of D as a function of q and to draw the graph with the *quantity* q on the *horizontal* axis and the *price* on the vertical axis as in Figure 1 on the back of this page. So then the graph is $p = D(q)$. Similarly the *supply curve* is the graph $p = S(q)$ that represents the relationship between the amount of a quantity producers are willing to supply to the market as a function of the price.

The point (p^*, q^*) where the demand and supply curves cross is called the *equilibrium point*, where supply and demand balance. In theory, that price p^* and that quantity q^* will be “found” by forces of the free market (possibly after some initial “settling down.”)¹

Questions

- (1) The area with $p^* \leq p \leq D(q)$ (see Figure 1) represents the *savings* that consumers realize if they buy the quantity at the market price p^* rather than the higher price they would have been willing to pay at $q < q^*$. This amount is called the *consumer surplus*. Thinking of the area in the picture, write this as a formula using definite integrals and other area formulas.
- (2) The area between the supply curve and the horizontal line $p = p^*$ is called the *producer surplus* – it represents the extra money producers make by selling their product at price p^* rather than the lower prices some would be willing to accept. Thinking of the area in the picture, write this as a formula using definite integrals and other area formulas.
- (3) A variety of local stores sell inexpensive thermal underwear (“long johns”) for those cold winter days. Suppose the supply curve for

¹Producers who set their price too high won’t sell their product; producers who set their price too low will realize they could have set their price higher when they see competitors making more money! Consumers won’t buy products if the prices are too high and they will buy at lower prices when they can.

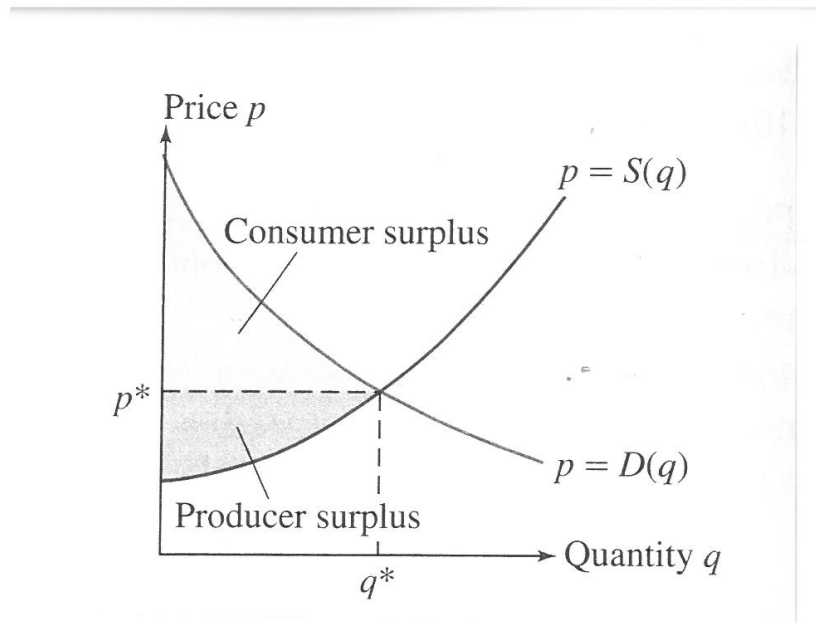


Figure 1: Supply and Demand Curves, Equilibrium Point, Consumer and Producer Surplus

one package of the underwear is $p = S(q) = 2q + 3$ (p in dollars per package and q in thousands of pieces) and the demand curve is $p = D(q) = \frac{21}{q+1}$. Determine the point (p^*, q^*) . Then determine the consumer surplus and the producer surplus when the underwear is sold at the price p^* .

Assignment: Group writeups due by the end of class.