6.2. Applications in Business and Economics

Definition 6.2.1. *Suppose x represents a possible numerical outcome of an experiment and that $[c, d]$ represents an interval of possible outcomes of the experiment. A* _____, *$y = f(x)$, is a function that helps us determine the probability that an outcome of x will occur in the interval $[c, d]$*

This functions must satisfy the following properties:

(1)

(2)

(3) When $[c, d]$ is an interval of real numbers then the probability of outcome x during the interval $[c, d]$ is

Example 6.2.1. *The shelf life (in years) of a certain brand of clock radio is a continuous random variable with probability density function*

$$f(x) = \begin{cases} \frac{4}{(x+4)^2} & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

What is the probability that a randomly selected clock radio has a shelf life of 1 year or less?

Example 6.2.2. *The time to failure of a product after it is sold is given by the probability density function*

$$f(t) = \begin{cases} 0.15e^{-0.15t} & \text{if } t \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

where t is time in months. What is the probability that a buyer chosen at random will have a product failure during the second year after purchase?

Consumers' and Producers' Surplus

Definition 6.2.2. *Suppose $p = D(x)$ is a price-demand equation for a product. Then the* _____, *CS, at a price level of $\overline{p}$*

where $\overline{x}$ is the demand at price $\overline{p}$.

Definition 6.2.3. *Suppose $p = S(x)$ is a price-supply equation for a product. Then the* _____, *PS, at a price level of $\overline{p}$*

where $\overline{x}$ is the demand at price $\overline{p}$.

Definition 6.2.4. *The point(s) where the price-demand equation and the price-supply*

equation intersect is called the _____ *and*

_____

Example 6.2.3. *The price-demand equation for a produce is* $p = D(x) = 13 - \frac{2}{3}x$. *If the equilibrium price is* \$7, *what is the consumer's surplus in dollars?*

Example 6.2.4. *The price-demand equation for a produce os* $p = D(x) = \frac{21}{3x+4}$. *If the equilibrium quantity is 1 unit, what is the consumer surplus in dollars?*

Example 6.2.5. *The price-supply equation for a produce os* $p = S(x) = 2x^2 + x + 5$. *If the equilibrium price is* \$15*, what is the producer's surplus in dollars?*

Example 6.2.6. *For a certain product, the price-demand and price-supply equations are* $p = D(x) = 20 - 3x^2$ *and* $p = S(x) = 3x + 2$ *respectively. Find the consumer surplus at the equilibrium price level.*

(1) 6
(2) 12
(3) 16
(4) 48
(5) none of these