

# Supply, demand, market equilibrium

from:

Harshbarger/Reynolds: Mathematical applications for the management, life, and social sciences

Houghton Mifflin Company 2007, ISBN 978-0-618-73162-6

p. 122, 123, 162

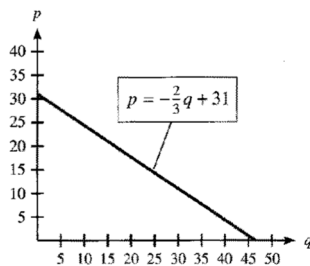


Figure 1.44

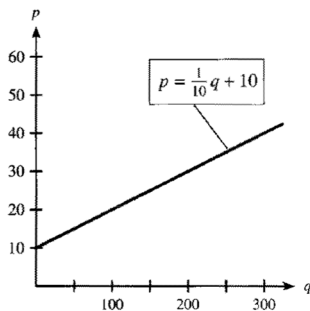


Figure 1.45

## Supply, Demand, and Market Equilibrium

Economists and managers also use points of intersection to determine market equilibrium. **Market equilibrium** occurs when the quantity of a commodity demanded is equal to the quantity supplied.

Demand by consumers for a commodity is related to the price of the commodity. The **law of demand** states that the quantity demanded will increase as price decreases, and that the quantity demanded will decrease as price increases. Figure 1.44 shows the graph of a typical linear demand function. Note that although quantity demanded is a function of price, economists have traditionally graphed the demand function with price on the vertical axis. Throughout this text, we will follow this tradition. Linear equations relating price  $p$  and quantity demanded  $q$  can be solved for either  $p$  or  $q$ , and we will have occasion to use the equations in both forms.

Just as a consumer's willingness to buy is related to price, a manufacturer's willingness to supply goods is also related to price. The **law of supply** states that the quantity supplied for sale will increase as the price of a product increases. Figure 1.45 shows the graph of a typical linear supply function. As with demand, price is placed on the vertical axis. Note that negative prices and quantities have no meaning, so supply and demand curves are restricted to the first quadrant.

If the supply and demand curves for a commodity are graphed on the same coordinate system, with the same units, market equilibrium occurs at the point where the curves intersect. The price at that point is the **equilibrium price**, and the quantity at that point is the **equilibrium quantity**.

For the supply and demand functions shown in Figure 1.46, we see that the curves intersect at the point (30, 11). This means that when the price is \$11, consumers are willing to purchase the same number of units (30) that producers are willing to supply.

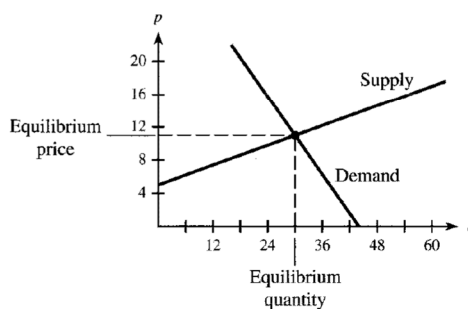


Figure 1.46

EXAMPLE 1 *Supply and Demand (Application Preview)*

If the supply function for a commodity is given by  $p = q^2 + 100$  and the demand function is given by  $p = -20q + 2500$ , find the point of market equilibrium.

**Solution**

At market equilibrium, both equations will have the same  $p$ -value. Thus substituting  $q^2 + 100$  for  $p$  in  $p = -20q + 2500$  yields

$$\begin{aligned}q^2 + 100 &= -20q + 2500 \\q^2 + 20q - 2400 &= 0 \\(q - 40)(q + 60) &= 0 \\q = 40 \quad \text{or} \quad q = -60\end{aligned}$$

Because a negative quantity has no meaning, the equilibrium point occurs when 40 units are sold, at (40, 1700). The graphs of the functions are shown (in the first quadrant only) in Figure 2.12.

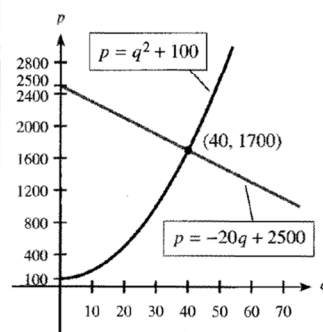


Figure 2.12