

**Linear Functions**

1. Sketch the graph of the following linear functions.

a)  $y = 3x - 4$

b)  $\frac{x}{3} - y = -6$

c)  $-2x + 8y = 0$

d)  $\frac{x}{2} - \frac{y}{3} = -4$

2. The slope of the line through (2,5) and (3,k) is 4. Find k.

3. Determine general linear form ( $Ax + By + C = 0$ ) of an equation of the straight line that has the indicated properties.

a) Passes through (3,-2) and has y-intercept 1.

b) Passes through (7,1) and (7,-5).

c) Passes through (10,4) and has slope  $\frac{1}{2}$ .

d) Passes through (-1,-1) and is parallel to the line  $y = 3x - 4$ .

e) Passes through (1,2) and is perpendicular to the line  $-3y + 5x = 7$ .

4. Determine whether the point (0,-7) lies on the line through (1,-3) and (4,9).

**Application of the Linear Functions**

1. **(Business)** A company finds that if it produces and sells  $q$  units of product, its total sales revenue in dollars is  $100\sqrt{q}$ . If the variable cost per unit is \$2 and the fixed cost is \$1200, find the values of  $q$  for which total sales revenue is;

$$\text{Total sales revenue} = \text{Variable cost} + \text{fixed cost}$$

2. **(Business)** Suppose that consumers will purchase  $q$  units of a product when the price is  $\frac{80-q}{4}$  dollars each. How many units must be sold in order that sales revenue be \$400?
3. **(Revenue)** The monthly revenue of a certain company is given by  $R = 800p - 7p^2$  where  $p$  is the price in dollars of the product. At what price will the revenue be \$10000, if the price must be greater than \$50?
4. **(Break Even)** A manufacturer of video game car sells each cartridge for \$19.95. The manufacturing cost of each cartridge is \$14.95. Monthly fixed costs are \$8000. During the first month of sales of a new game, how many cartridges must be sold in order for the manufacturer to break even? (that is, in order that total revenue equal to total cost)?
5. **(Market Equilibrium)** When the price of product is  $p$  dollars each, suppose that a manufacturer will supply  $2p-8$  units of the product to the market and that consumers will demand to buy  $300-2p$  units. At the value of  $p$  for which supply equals demand, the market is said to be in equilibrium. Find this value of  $p$ .
6. **Depreciation.** A copy machine was purchased by a law firm for \$8,000 and is assumed to have a depreciated value of \$0 after 5 years. The firm takes straight-line depreciation over the 5-year period.
- Find a linear equation that expresses value  $V$  in dollars in terms of time  $t$  in years.
  - What is the depreciated value after 3 years?
  - What is the slope of the graph of the equation found in part A? Interpret verbally.
7. A company receives \$45 for each unit of output sold. It has a variable cost of \$25 per item and a fixed cost of \$1600.  
What is its profit if it sells (a) 75 items, (b) 150 items, and (c) 200 items?

8. Water freezes at 32 degrees Fahrenheit or 0 degrees Celsius and boils at 212 degrees Fahrenheit or 100 degrees Celsius. Find a function converting degrees Celsius to degrees Fahrenheit. Use the function to convert 30 degrees Celsius to degrees Fahrenheit.
9. A company produces 100 tools for \$125,500 and the cost of producing 101 tools is \$126,700.
  - a) Write the cost function  $C(x)$ , assuming it is linear.
  - b) Find and interpret the slope of the graph of  $C$ .

### **Application of the Inequalities**

#### **1. (Profit)**

To produce 1 unit of a new product, a company determines that the cost for material is \$2.50 and the cost of labor is \$4. The constant overhead, regardless of sales volume is \$5000. If the cost to a wholesaler is \$7.40 per unit, determine the least number of units that must be sold by the company to realize a profit

#### **2. (Revenue)**

Suppose consumers will purchase  $q$  units of a product at a price of  $\frac{100}{q} + 1$  dollars per unit.

What is the minimum number of units that must be sold in order that sales revenue be greater than \$5000.