

Section 8.2 Linear Functions

- 1) Sketch the graph of the following function.

$$f(x) = \frac{2}{3}x + 1$$

- 2) Find the x - and y -intercepts of the following lines and graph the lines:
- a) $\frac{x}{2} - \frac{y}{3} = 600$
 - b) $0.09x - 0.06y = 54$
- 3) Find the slope of the following lines and graph the lines:
- a) $3x - 5y = 1.5$
 - b) $y + 11 = 0$
- 4) Find the equations of the lines passing through the following points, identify x - and y -intercepts and slope for each, and sketch their graphs.
- a) $(-2, 0)$ and $(0, 3)$
 - b) $(\frac{3}{4}, -3)$ and $(-5, \frac{1}{8})$
- 5) Consider the points $(3, 2)$ and $(5, -2)$ and the linear function whose graph passes through them.
- a) Find the slope of the line.
 - b) Find the slope-intercept form of the equation of the line.
 - c) Write the equation of the line in the standard form.
- 6) Sarah wants to go skating at Super Skate ice rink. She has to pay a \$7 entrance fee and \$1.25 for every minute she is on the rink.
- a) Write an equation to determine the cost (C) in terms of the number of minutes (t) that she is on the rink.
 - b) If she only has \$43.25, find the number of minutes she can be on the rink.
- 7) If you earn \$30,000 per year and you spend \$29,000 per year, write amount of money you save A after y years, assuming you start with no money.
- 8) Given the two points $(2, 3)$ and $(0, 4)$, find the rate of change. Is this function increasing or decreasing?
- 9) The balance in your college payment account C , is a function of the number of quarters q , you attend. Interpret the function $C(q) = 20000 - 4000q$ in words and explain the meaning of each number and symbol in this equation. How many quarters of college can you pay for until this account is empty?
- 10) Graph $f(x) = 5 - \frac{2}{3}x$ using the vertical intercept and slope. Using the fact that the slope $-\frac{2}{3}$ could also be written as $\frac{2}{-3}$, find a point on the graph that has a negative x value.
- 11) Consider the graph of $j(t) = 5 - t$ and determine the following for the function $j(t)$:
- a) Vertical intercept coordinates
 - b) Horizontal intercepts coordinates

- c) Slope
 - d) Is $j(t)$ an increasing or decreasing function (or neither)
- 12) A company purchased \$120,000 in new office equipment. Then expect the value to depreciate (decrease) by \$16,000 per year. Find a linear model for the value, then find and interpret the horizontal intercept and determine a reasonable domain and range for this function.
- 13) A manager for a country market will spend a total of \$80 on apples at \$0.25 each and pears at \$0.50 each. Write the number of apples she can buy as a linear function of the number of pears. Find the slope and interpret your answer. Graph the function.
- 14) At a price of \$2.28 per bushel, the supply of barley is 7,500 million bushels and the demand is 7,900 million bushels. At a price of \$2.37 per bushel, the supply is 7,900 million bushels and the demand is 7,800 bushels.
- a) Assuming that price and supply are linearly related, determine the price in terms of supply (the *price-supply equation*).
 - b) Assuming that price and demand are linearly related, determine the price in terms of demand (the *price-demand equation*).
 - c) Find the equilibrium point (price and the number of units for which supply and demand are equal).
 - d) Graph the price-supply equation, price-demand equation and the equilibrium point in the same coordinate system.
- 15) A plant can manufacture 50 tennis racquets per day for a total daily cost of \$3,855 and 60 tennis racquets per day for a total daily cost of \$4,245.
- a) Assuming that daily cost and production are linearly related, find the total daily cost C of producing x tennis racquets.
 - b) Interpret the slope and y -intercept of this cost equation.
 - c) Graph the total daily cost for $0 \leq x \leq 100$.
- 16) NewTech Wireless company offers a monthly calling plan where the total cost is linearly related to the number of minutes used. Given that the total monthly cost for 100 minutes used is \$35.00 and that for 200 minutes the cost is \$45.00:
- a) Express the cost C in terms of the number of minutes used t .
 - b) What is the domain and the range of this function?
 - c) What is the basic cost for the plan and what is the cost per minute?
 - d) Sketch the graph of this function.
 - e) What will be the cost if 400 minutes are used in a month?
 - f) If the total cost for a month was \$40.00, how many minutes were used?

- 17)** A security company purchases a new security van for \$53,000 and assumes that in 5 years it will have a trade-in value of \$28,000.
- a)** Find the linear model for the depreciated value V of the van after t years.
 - b)** What is the depreciated value of the van after 3 years?
 - c)** When will the depreciated value fall below \$23,000?
 - d)** Interpret the slope and the y-intercept of $V(t)$ (explain what the slope and the y-intercept represent in this context).
- 18)** At \$10 per ticket, Willie Williams and the Wranglers will fill all 8,000 seats in the Assembly Center. The manager knows that for every \$1 increase in the price, 500 tickets will go unsold.
- a)** Write the number of tickets sold n as a function of the ticket price p .
 - b)** What are the limits of the independent variable, if any?
- 19)** The manufacturer of a new type of frying pan has calculated the monthly fixed costs to be \$83,000 and variable costs of \$7.35 for each frying pan produced. The pans are sold to a distributor for \$20 per pan. The monthly manufacturing capacity is 20,000 units.
- a)** Write the monthly cost function C in terms of number of units produced x . Determine its domain and range and graph it.
 - b)** Write the monthly revenue function R in terms of number of units produced x . Determine its domain and range and graph it.
 - c)** Write the monthly profit function P in terms of number of units produced x , assuming that all units produced are sold. Determine its domain and range and graph it.
 - d)** What will be their profit/loss if they are running at 25% capacity? At 75% capacity?
 - e)** How many units must they produce and sell in a month to break even? What percent is that of production capacity? What must be the sales to break even?
 - f)** How many units must they produce and sell in a month to make \$100,000 in profit?
- 20)** A manufacturing company, under contract to deliver a new line of beer bottles, estimates that it would cost \$41,000 to produce 80,000 bottles while it would cost \$59,000 to produce 120,000 bottles. Based on the cost analysis of previous production runs, they determined that that a linear model would best represent the costs of production.
- a)** Assuming that the cost C and the number of bottles produced x are linearly related, determine the cost function $C(x)$.
 - b)** What are the fixed costs in this model and what is the variable cost per bottle?