Section 1.3 Linear Functions – Review Exercises

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)** $\left(\frac{3}{4}, -3\right)$ and $\left(-5, \frac{1}{8}\right)$

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 $-2/3$ 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?