

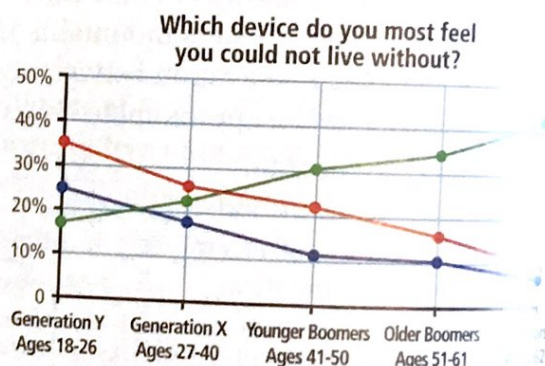
6.1 Graphs of Relations, pages 268–278

1. Consider the following scenario.

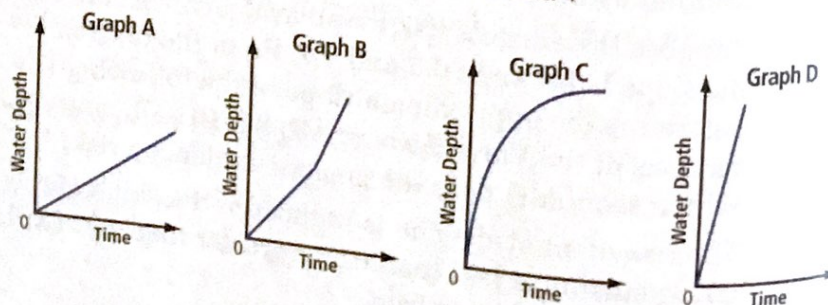
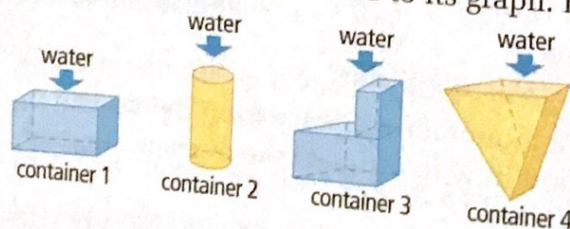
Your car's gas tank is about half full. You drive to meet Ahmed and Jackie at the movie theatre which is on the way to Ahmed's house. There is a gas station located on the edge of town just past Ahmed's house. After the movie, you drive your friends home. First you drop off Ahmed. On your way to Jackie's house, you realize that you have only one quarter of a tank of gas left, so you stop at the gas station and fill up. You drive Jackie home and then you drive to your home.

- a) Draw a map to represent this scenario. Then, based on your map, sketch a graph showing your distance from home versus time.
- b) Sketch a graph showing the amount of gas in the car's gas tank versus time.

2. The lines on the graph represent three devices: televisions, computers, and cell phones. Which line do you think represents each device? Explain your answer.



3. The graphs show the depth of water as various containers are being filled. Match each container to its graph. Explain your choice.



6.2 Linear Relations, pages 279–291

4. Is each relation linear or non-linear? Explain your choice.

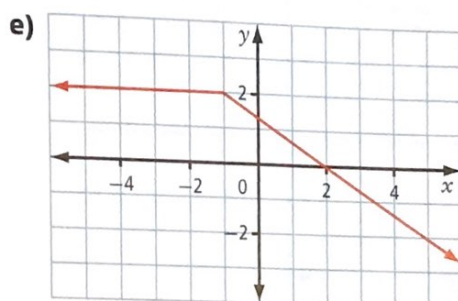
a) the orbit of a planet around the sun on an elliptical path, in terms of time and distance of the planet from the sun

b) $(-10, -5), (-5, 0), (0, 5), (5, 10)$

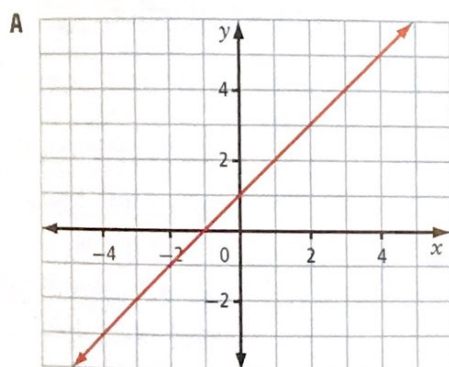
c) $y = 2x^2 + 3x - 1$

d)

x	y
82	16
91	20
100	25
109	31
118	38



5. Which of the following represent the same relation?



B

x	y
-2	0
0	2
2	4
4	6

C One number is double another.

D $(-2, 0), (0, 2), (2, 4), (4, 6)$

6. Katya wants to sell a camper trailer.

The cost to place an advertisement in a newspaper is \$37.95 for three lines of text and a picture, plus \$7 for each additional line of text. Consider the relation of total cost versus number of lines of text.

a) Is this relation linear? Explain.

b) Identify the dependent variable and the independent variable.

c) Create a set of ordered pairs to represent 3, 4, 5, 6, and 7 lines of text in Katya's advertisement.

d) Is this relation discrete or continuous?

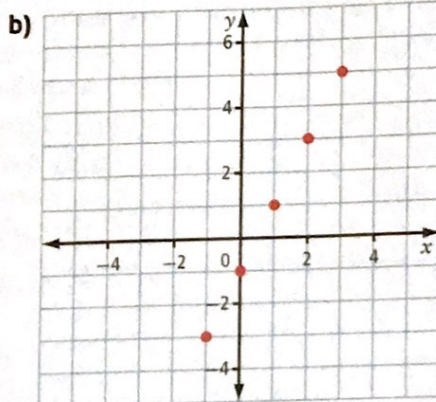
e) Graph the relation.



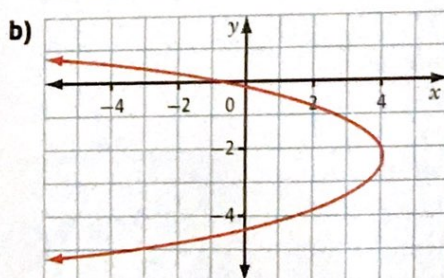
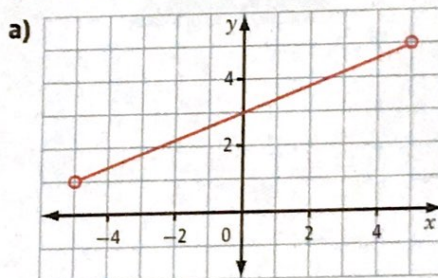
6.3 Domain and Range, pages 292–304

7. State the domain and range of each relation.

a) $(-9, 5)$, $(-5, 5)$, $(0, 5)$, $(0, 8)$, $(2, 8)$



8. Express the domain and the range of each relation as a number line, in interval notation, and in set notation.



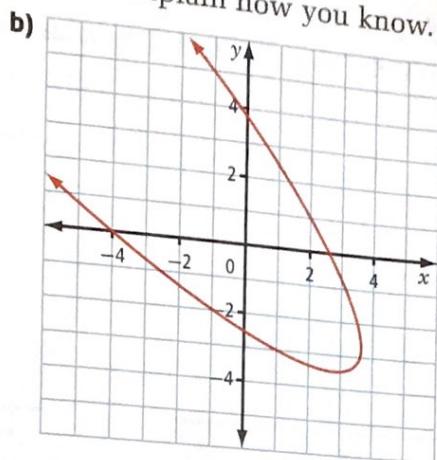
6.4 Functions, pages 305–314

9. The circumference of a circle is given by the function $C(d) = \pi d$, where d is the diameter of the circle. Write this function as a linear formula in two variables.
10. The formula for volume of a cube with radius r is $V = r^3$. Write this formula using function notation.

11. Which relations are functions? Explain how you know.

a)

x	y
1	1
2	2
3	3
4	4
5	5



c)

Hair Colour	Gender
brown	male
black	male
black	female
blonde	female
red	female

d) (2.3, 5.1), (8.6, 9.4), (8.6, 9.2), (9.5, 10.0)

12. The function $M(E) = \frac{E}{2.7}$ can be used to approximate your weight, M , in kilograms, on Mars, where E , in kilograms, is your weight on Earth.

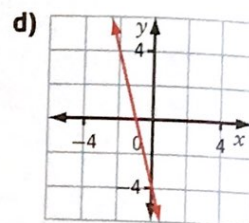
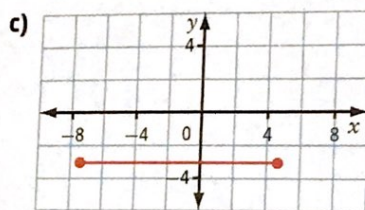
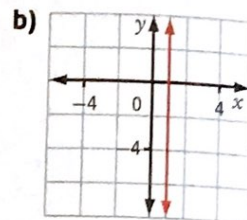
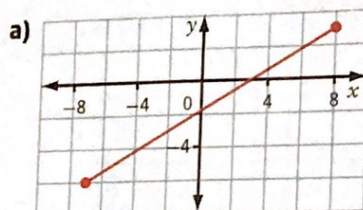
- Suppose you weigh 66 kg on Earth. How much would you weigh on Mars?
- How much would a Martian who weighs 14 kg on Mars weigh on Earth?

13. For her local Run for the Cure, Amber donates \$50 of her own money. She also collects \$25 pledges. The function $P(n) = 25n + 50$ represents the total funds she contributes.

- Determine an appropriate domain and range. Then, use a table of values to graph the function.
- Determine the value of $P(8)$. Explain the meaning of your answer.
- Prizes are awarded to students who collect more than \$675. How many pledges must Amber collect to receive a prize?
- Explain why this situation depicts a function.

6.5 Slope, pages 315–329

14. Determine the slope of each line segment or line.



Did You Know?

Blackstrap Mountain was made in 1969–1970 for the 1971 Canada Winter Games in Saskatoon.

15. Blackstrap Mountain in Blackstrap Provincial Park, SK, is an artificial hill. The hill is approximately 90 m high with an average rate of change from top to bottom of $\frac{1}{5}$. If the coordinates $(0, 90)$ represent the top of Blackstrap Mountain, what coordinates represent its bottom?

16. Use the slope formula to determine the slope of the line passing through each pair of points.

a) $(-3, 8)$ and $(13, 12)$

b) $(5.6, -8.2)$ and $(-0.4, 3.2)$

17. Carl is running in a 10-km race.

a) Create a graph showing Carl's progress during the race. Plot distance, in kilometres, as the dependent variable and time, in minutes, as the independent variable. Start your graph at the point $(0, 0)$ and draw a line with a slope of $\frac{1}{4}$.

b) What does each point on the graph represent?

c) At what point does your line end? What does this point represent?

d) Explain the meaning of slope in this situation.

18. In Manitoba, the number of people aged 12 and older who have asthma was 63 028 in 1996 and 73 427 in 2005.

a) What was the average rate of change per year?

b) What does this rate of change represent?

c) If the number of people in Manitoba living with asthma continues to increase at this rate, how many people in Manitoba will have asthma in 2017?

Multiple Choice

For #1 to #5, choose the best answer.

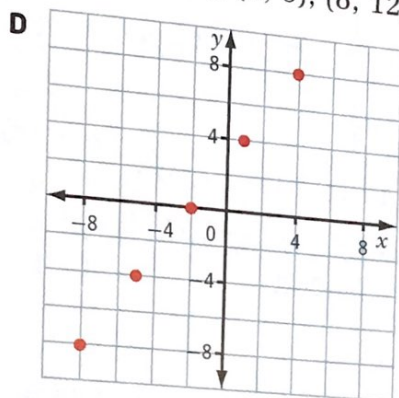
1. Which of these relations is *not* linear?

A $y + 3 = \frac{2}{3}x$

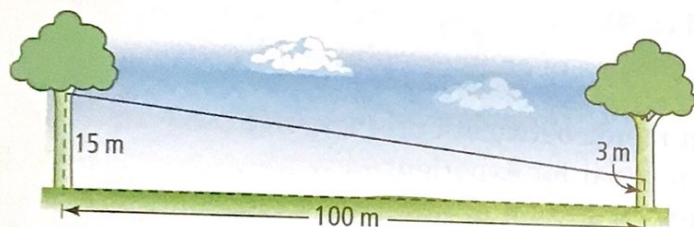
B $(2, 3), (4, 6), (6, 9), (8, 12)$

C

a	d
-2	3
-1	4
0	6
1	8
2	11



2. A zip line is attached to two trees as shown. What is the slope of the line?



A $\frac{10}{12}$

B $\frac{3}{10}$

C $-\frac{6}{5}$

D $-\frac{3}{25}$

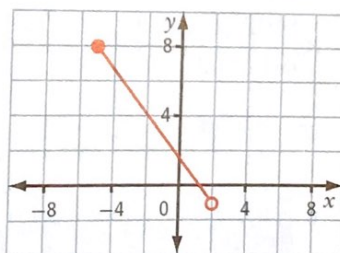
3. Determine the domain of the relation in the graph.

A $\{-5, -4, -3, -2, -1, 0, 1, 2\}$

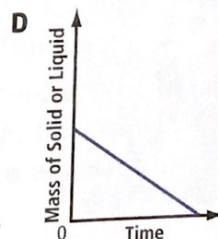
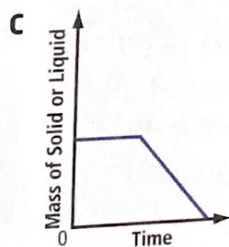
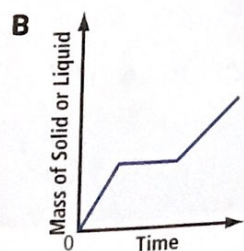
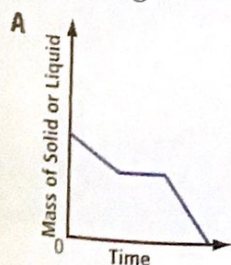
B $[-5, 2)$

C $\{x \mid -5 < x \leq 2, x \in \mathbb{R}\}$

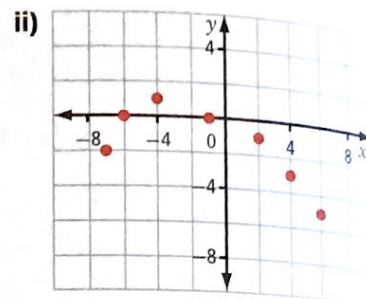
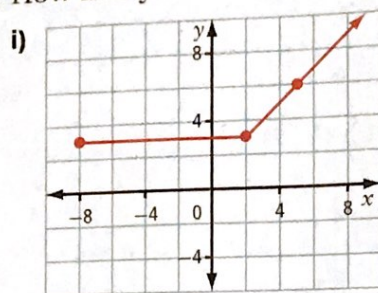
D all numbers between -5 and 2, inclusive



4. As ice is heated, it changes state from solid to liquid and then to gas. Which graph could represent the amount of solid or liquid remaining as heat is applied to a block of ice?



5. How many of these relations are functions?



iii) $(1, 8), (2, 12), (5, 12), (7, 18)$

iv) $(-9, -9), (-3, -3), (-1, 0), (9, 9)$

A 1

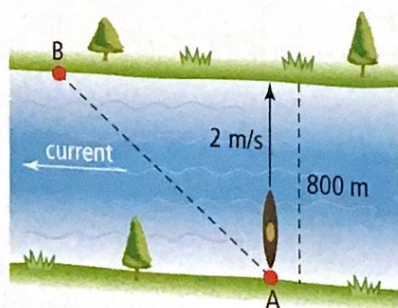
B 2

C 3

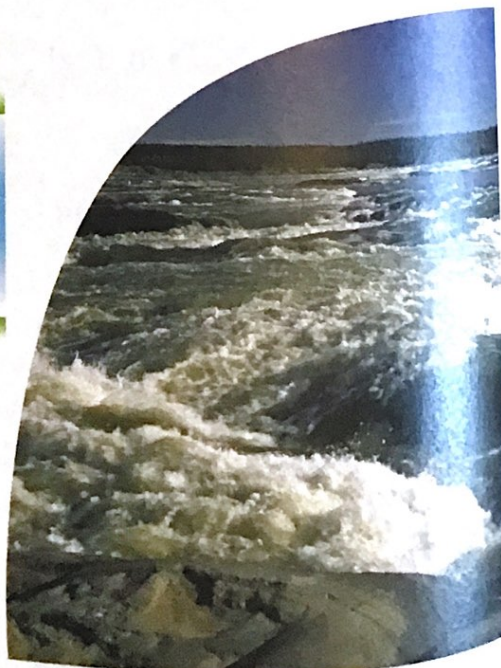
D 4

Short Answer

6. a) Determine the slope of the line that passes through the points $(-2, -3)$ and $(5, 4)$.
 b) Give the coordinates of another point on this line.
7. The Slave River rapids between Fort Fitzgerald, AB, and Fort Smith, NT, are popular for experienced whitewater kayakers. To cross an 800-m-wide section of the river, a kayaker points his kayak perpendicular to the current. He maintains this position as he paddles at a rate of 2 m/s. However, the current affects the kayaker's actual course. He reaches the other side in 6 min 40 s (400 s) at a point 2000 m downstream from his original position.



- a) What is the kayaker's average rate of change from point A to point B?
 b) In the context of this question, what does this rate represent?



8. A boat travelling at 5 m/s begins to accelerate. Its new speed, S , in metres per second, is modelled by the function $S(t) = 5 + 2.5t$, where t is the length of time, in seconds, that it accelerates.

- What does $S(6)$ represent?
- Determine the value of $S(6)$.
- How long does the boat accelerate in order to reach a speed of 23 m/s?

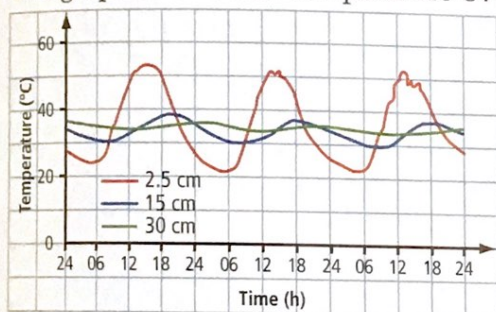
9. Select and graph the function that represents continuous data.

Function A: $f(x) = 2x - 5$, where the domain is $\{x \in \mathbb{R}\}$

Function B: $h(x) = 3x + 4$, where the domain is $\{-2, -1, 0, 1, 2\}$

Extended Response

10. The graph shows soil temperature over 3 days at different depths.



- All three curves have the same domain. Express this domain in words.
 - Express the range for the curve representing a depth of 2.5 cm using a number line.
 - Express the range for the curve representing a depth of 15 cm using interval notation.
 - Express the range for the curve representing a depth of 30 cm using set notation.
 - What conclusions can you make from these relations?
11. Dan is training for the Canadian Orienteering Championships in Spruce Woods Provincial Park, MB. Create a distance-time graph showing Dan's distance from the start as he completes the practice course shown.

