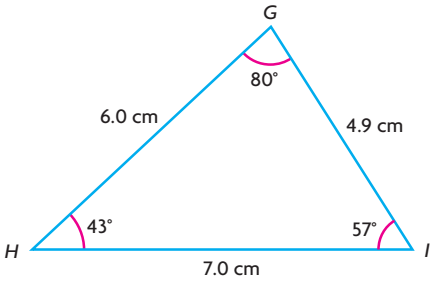
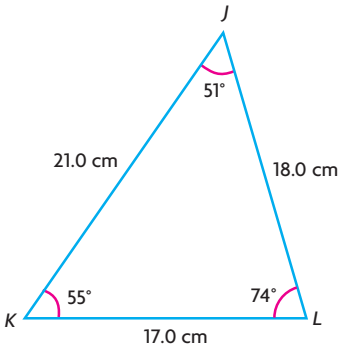
c)



d)



10. **a)** 96°, 84°
b) 10.8 cm

Chapter Self-Test, p. 316

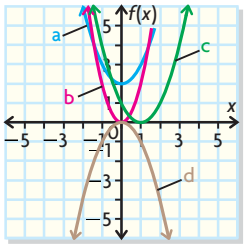
1. 3 m
2. Yes, the angle of elevation is 6.4°, which is greater than 4.5°.
3. $x \doteq 111$ m, $y \doteq 108$ m
4. **a)** $\angle A \doteq 120°$, $\angle C \doteq 33°$, $a \doteq 29$ cm
b) $\angle F = 47°$, $d \doteq 31$ cm, $e \doteq 37$ cm
5. 2 m
6. 8 m
7. 795 m
8. 197 m

CHAPTER 6

Getting Started, pp. 320–322

1. **a)** (i) **c)** (vi) **e)** (iv)
b) (iii) **d)** (v) **f)** (ii)
2. **a)** about 175 m
b) about 30 s; Started fast for 8s; then slower; then top speed
c) for first 8 s started off slower; then sped up; at 20 s full speed
3. **a)** Moved to the right 5 units, stretched by a factor of 3, and moved up 4 units
b) Moved to the right 2 units, stretched by a factor of 2, and moved up 1 unit
c) Moved to the left 1 unit, compressed by a factor of 0.5, and moved down 3 units
d) Moved to the left 2 units, reflection in the x-axis and compressed by a factor of $\frac{1}{4}$, and moved down 4 units

4. **a)** **i)** 0.5; Truck is moving at a steady pace away from the detector.
ii) (0, 1.5); Spot where the truck starts away from the detector.
iii) 0; Truck is not moving for 2 s.
iv) (8, 0); Truck stops and this is how long it took for the truck to go the entire distance (to and from the detector).
b) domain: $\{t \in \mathbf{R} \mid 0 \leq t \leq 8\}$; range $\{t \in \mathbf{R} \mid 0 \leq d \leq 3\}$
5. **a)** $\sin A = \frac{3}{5}$; $\cos A = \frac{4}{5}$; $\tan A = \frac{3}{4}$
6.

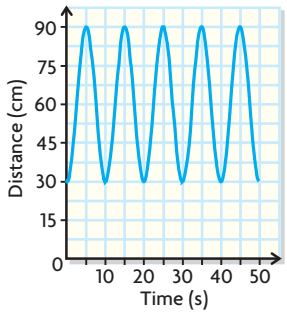


7. **a)** max: 4; zeros: (0, 0), (6, 0); domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} \mid y \leq 4\}$
b) min: −2.5; zeros: (−3, 0), (1, 0); domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} \mid y \geq -2.5\}$
8.

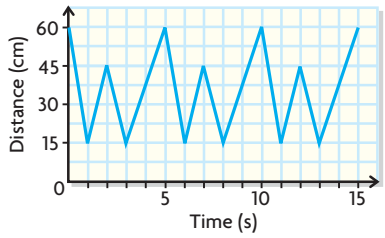
Definition:	Ways to Test:
A function is an equation that has only one corresponding value of y for each value of x.	Graph the equation on a co-ordinate grid. You should be able to draw a vertical line through the graph at any point and not have it intersect the graph at more than one point. If a vertical line does intersect the graph at more than one point, then the graph is not a function.
Function	
Example:	Non-examples:
$y = 6x^2 - 13$	$x = 6y^2 - 13$

Lesson 6.1, p. 325

1. **a)**

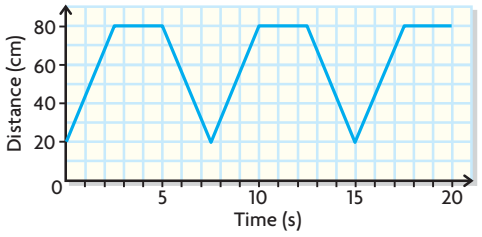


b)



Answers

2. Explanation: Start the paddle at 20 cm from the sensor. For 2.5 s, move to 80 cm. For 2.5 s, do not move the paddle. For 2.5 s more, move to 20 cm from the sensor. Repeat this 3 times.



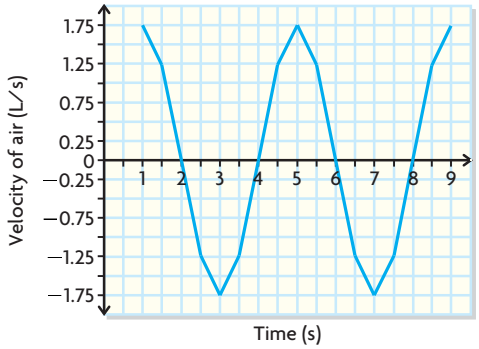
Lesson 6.2, pp. 330–334

1. **a)** yes; pattern is repeated
b) yes; pattern is repeated
c) no; not a function

2. days 89 and 119

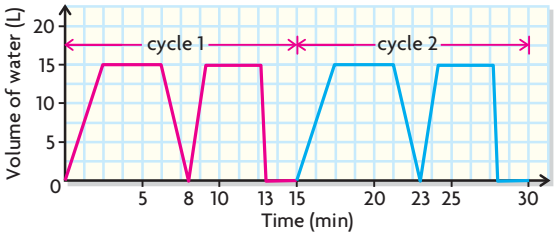
3. 5

4. **a)**

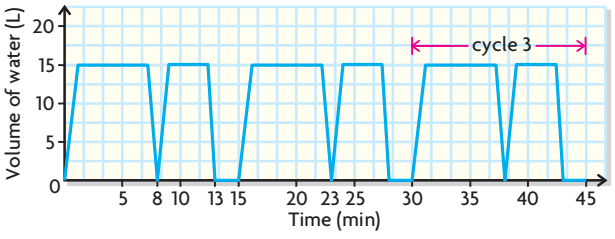


b) 4 s
c) breathing in, breathing out
e) 10 s, 12 s, 14 s, 16 s, 18 s

5. **a)**



b) 15 min; time for one dishwasher cycle
c)

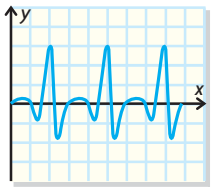


d) 240 L
e) domain: $\{t \in \mathbf{R} \mid 0 \leq t \leq 120\}$; range: $\{v \in \mathbf{R} \mid 0 \leq v \leq 15\}$

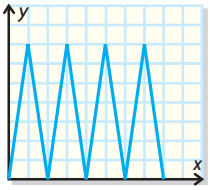
6. **a)** 8 s
b) time to complete one full rotation
c) 6 m; maximum height
d) 4 m
e) $t = 4$, $t = 12$, $t = 20$
f) $t = 2$, $t = 6$, $t = 10$, $t = 14$, $t = 18$, $t = 22$

7. **a)** yes; repeating pattern
b) no
c) no
d) yes; repeating pattern
e) no
f) yes; repeating pattern

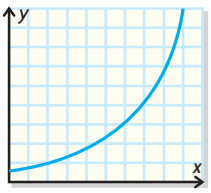
8. **a)** yes; heart beats regularly



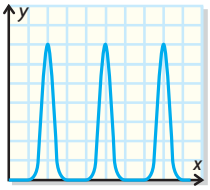
d) yes; steady pace



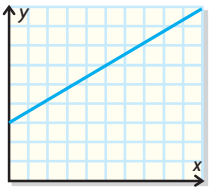
b) no



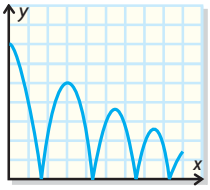
e) yes; repeated rotation



c) no



f) no

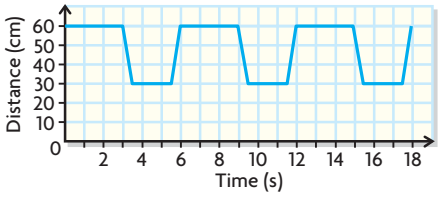


9. **a)** The wave pattern is repeating.
b) The change is 10 m.

10. **a)** The washer fills up with water, washes the dishes but does not add water, dishwasher empties of water, fills up again with a small amount of water, rinses again, and fills up one more time to rinse dishes, and empties again, and then waits 2 min before starting this cycle all over again.
b) 26 min
c) 50 L, 10 L, 50 L
d) 110 L

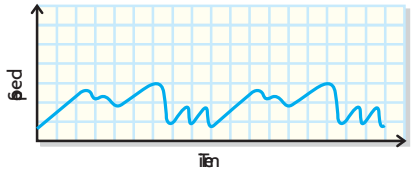
11. The paddle is moved in a steady back and forth motion in front of the detector.

12.

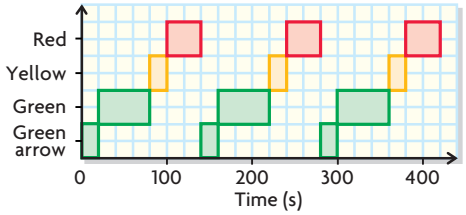


13. A periodic function is a function that produces a graph that has a regular repeating pattern over a constant interval. E.g. A search light on top of a lighthouse—this will go around in a circular period during the same time period and then keep repeating this pattern.

14. approximately periodic; speeds will vary slightly from lap to lap



15. **a)** The light is green for 60 s, yellow for 20 s, red for 40 s, and keeps repeating this pattern.
b) 120 s
c) 140 s



Lesson 6.3, pp. 339–343

1. **a)** yes; repeating pattern of waves
b) no; not the same shape as a sine function
c) no; not the same shape as a sine function

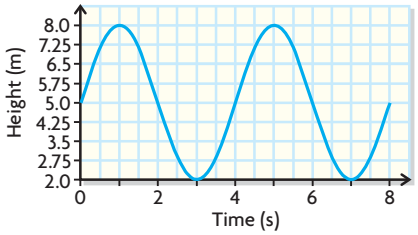
2. **a)** 2 s; takes time to get into rhythm
b) 2 s; time to complete one jump
c) $H = 2.25$
d) amplitude = 1.75 m; amplitude is maximum or minimum distance above axis

3. **a)** $D = 9$; where the swing is location between the up swinging and down swinging
b) $a = 5$
c) 4 s; time to complete one full swing
d) 4 m from the detector
e) No. When she is initially starting to swing, the amplitude between the successive waves would be getting larger.
f) yes, she's swinging away from the detector

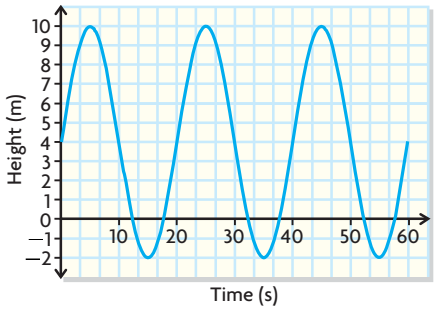
4. **a)** 0.03
b) $y = 0$
c) 4.5
d) period in seconds; axis: current in amperes; amplitude in amperes

5. **a)** period = 360°; axis $y = 3$; amplitude = 2
b) period = 360°; axis $y = 1$; amplitude = 3
c) period = 720°; axis $y = 2$; amplitude = 1
d) period = 180°; axis $y = -1$; amplitude = 1
e) period = 1440°; axis $y = 0$; amplitude = 2
f) period = 720°; axis $y = 2$; amplitude = 3

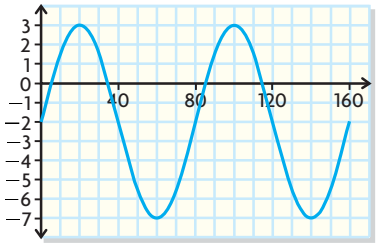
6. **a)**



b)

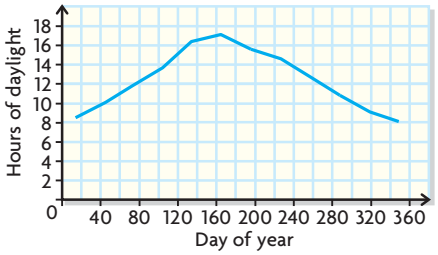


c)



7. **a)** periodic because it's a regular, predictable cycle
b) not sinusoidal; maximum values change from day to day, so do the minimum values

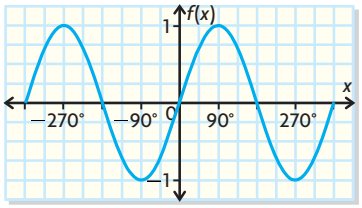
8. **a)**



b) 365 days
c) $y = 12.6$ h; average number of hours of sunlight per day over the entire year
d) $a = 4.5$ h; how many hours more or less one might expect to have from the average number of hours of sunlight per day

9. **a)** 20 m **c)** 2 m
b) 12 m **d)** 12 m

10. **a)**



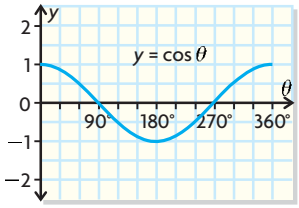
b) period: 360°; axis: $y = 0$; amplitude: 1

11. **a)**

Rotation (θ)°	0	30	60	90	120	150	180
cos θ	1	0.866	0.5	0	−0.5	−0.866	−1

Rotation (θ)°	210	240	270	300	330	360
cos θ	−0.866	−0.5	0	0.5	0.866	1

b)



c) yes; it's the sine curve shifted left 90°

d) period: 360°; axis: $y = 0$; amplitude = 1

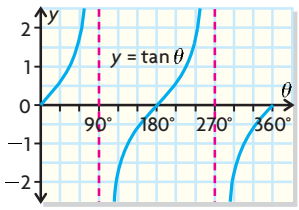
e) $\sin\theta^\circ = \cos(\theta - 90^\circ)$

12. a)

Rotation (θ)°	0	30	60	90	120	150	180
tan θ	0	0.58	1.73	E	−1.7	−0.58	0

Rotation (θ)°	210	240	270	300	330	360
tan θ	0.58	1.7	E	−1.7	−0.58	0

b)



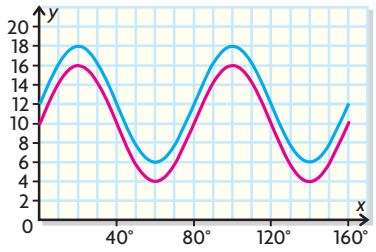
c) no; it's a periodic function

d) period: 180°; axis: $y = 0$; no amplitude because there are no maximum or minimum values; vertical asymptotes at 90° and 270°

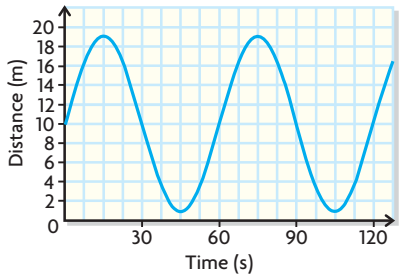
Lesson 6.4, pp. 348–353

1. Ferris wheel C: max. height 15 m; amplitude/radius = 7 m; speed = 0.55 m/s; period 80 s longer ride than A and B; speed between A and B; higher than A and B

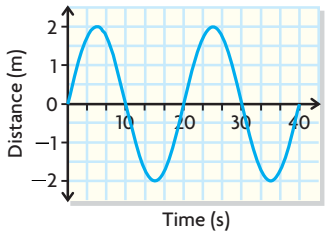
2.



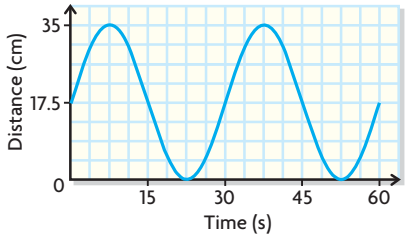
3. a)



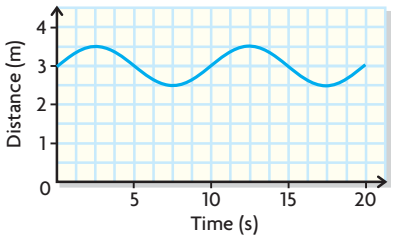
b)



c)



d)



4. a) $y = 0$; the brief instance in time when you are between inhaling and exhaling

b) 0.8 L/s

c) period: 6 s; amount of time to breathe in and out, one cycle

d) domain: $\{t \in \mathbf{R} \mid t \geq 0\}$; range: $\{V \in \mathbf{R} \mid -0.8 \leq V \leq 0.8\}$

5. a) deeper breaths; period is the same

b) amplitude

c) +0.16 L/s

6. A: $r = 2$; period = 6 s; speed = 6.3 m/s, height of axle = 1.5 m; B: $r = 3$; period = 9 s; speed = 2.1 m/s, height of axle = 2.5 m

7. a) Experiment 1 and graph c); Experiment 2 and graph b); Experiment 3 and graph a); Experiment 4 and graph d)

b) graph a): $y = 20$; graph b): $y = 30$; graph c): $y = 30$; graph d: $y = 20$; for all graphs the equation of the axis represents the height of wheel axle above ground

c) graph a): 20 cm; graph b): 20 cm; graph c): 30 cm; graph d): 10 cm

d) graph a): 125.5 cm; graph b): 188.5 cm; graph c): 188.5 cm; graph d): 125.5 cm; circumference of the wheel

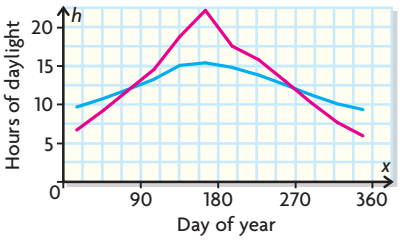
e) $r = 30$ cm

f) $r = 20$ cm

g) $h = 25$ cm

h) straight line

8. a)

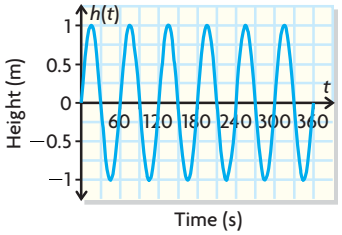


b) 40° latitude (approximately): period: 365 days; axis: $h = 12$; amplitude: 3
60° latitude (approximately): period: 365 days; axis: $h = 12$: amplitude: 6.5

c) higher latitude results in larger deviations in the number of hours of sunlight throughout the year

9. periods are the same; period = 0.5 s, equations of the axes are the same; $d = 0$, amplitudes differ; one is 2 cm, the other is 1.5 cm; implications: greater wind speed makes the pole vibrate farther from left to right

10. **a)**

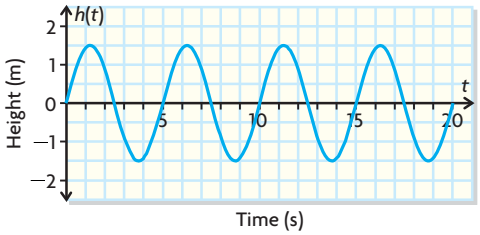


b) 60 s; based on period

c) radius = 1; based on amplitude

d) centre is at water level; based on the equation of the axis

11. **a)**

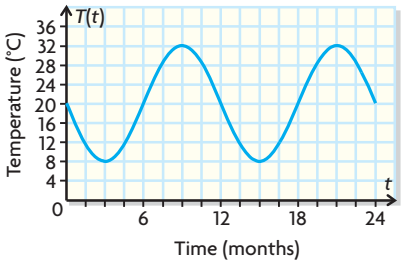


b) 5 s ; look at the time that passes between peaks

c) 12 waves; Since it takes 5 s for 1 cycle, 12 cycles would give you 60 s (1 min).

d) 3 m; distance between max and min values

12. **a)**



b) 12 months or 1 year

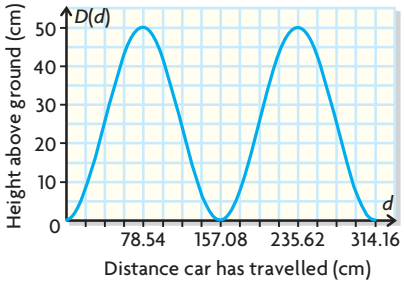
c) between 8° C and 32° C

d) 20 °C

13. Look at the periods, amplitudes, domains, ranges, maximum, minimum, etc.

14. **a)** one cycle, or $\pi d = 50\pi$

b)



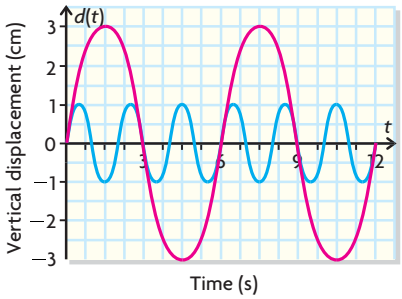
c) approximately 50 cm

d) between 170 and 180 cm

15. **a)** clockwise

b) 6 s

c) blue: smaller gear; red: larger gear



d) 3 cm

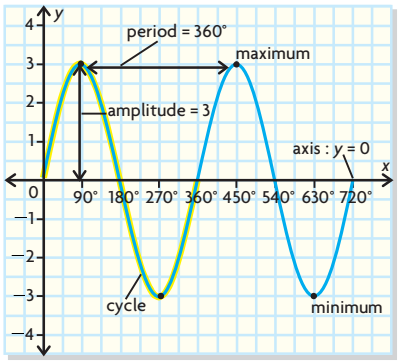
e) approximately 0.8 m

f) $d = 0$

Mid-Chapter Review, pp. 357–358

1. **a)** yes **b)** no **c)** yes **d)** no **e)** yes

2. Cycle–time it takes to complete one action or activity. E.g., dishwasher cycle, turn of Ferris wheel.
Period—change in maximum values—time it takes to go from one peak of the wave to the next peak of the wave.
Amplitude—vertical distance from its axis to its maximum (or minimum) value.
Equation of the axis—the value that is halfway between maximum and minimum value.
Maximum—highest value during the cycle.
Minimum—lowest value during the cycle.



3. **a)** yes **b)** 60 psi **c)** 120 psi **d)** 80 s **e)** 20 s

4. **a)** 1.2 s **b)** 50 times **c)** $\{p \in \mathbf{R} | 80 \leq p \leq 120\}$

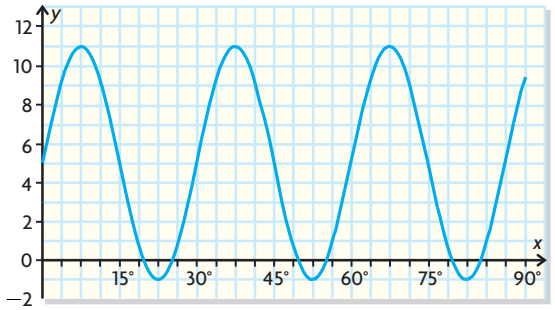
5. **a)** 2 s; the time it takes for the pendulum to swing one full cycle

b) $y = 0$, resting position of the pendulum

c) 0.25 m; how far the pendulum swings left or right from the resting position

d) 0.15 m

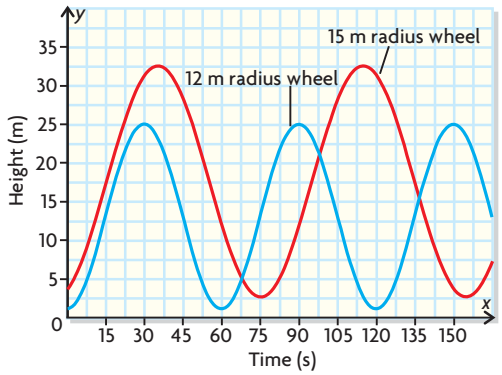
6.



7. **a)** period: 4; amplitude: 1; axis: $y = 3$
b) period: 180°; amplitude: 4; axis: $y = 8$

8. **a)** Monique: period: 3; amplitude: 2; axis: $d = 5$; Steve: period: 3.5, amplitude: 3; axis: $d = 5$
b) Monique is swinging faster.
c) Monique: $\{d \in \mathbf{R} | 3 \leq d \leq 7\}$;
Steve: $\{d \in \mathbf{R} | 2 \leq d \leq 8\}$

9. **a)**



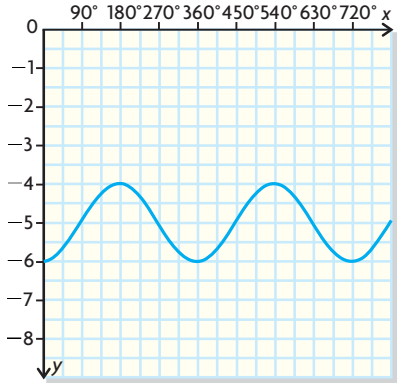
b) First Ferris wheel: perio: 60 s; amplitude: 12 m; axis: $y = 14$
Second Ferris wheel: period: 75 s; amplitude: 15 m; axis: $y = 18$

c) The 2 Ferris wheels are traveling at the same speed. This can be calculated by finding the circumference of both Ferris wheels and dividing each by the time each Ferris wheel takes to travel its circumference. This gives the distance travelled per second for each Ferris wheel, which is the same.

Lesson 6.5, pp. 365–367

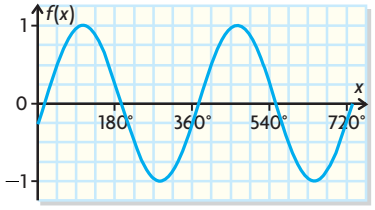
1. **a)** horizontal translation of -40; domain: $\{x \in \mathbf{R}\}$;
range: $\{y \in \mathbf{R} | -1 \leq y \leq 1\}$
b) vertical translation of 8; domain: $\{x \in \mathbf{R}\}$;
range: $\{y \in \mathbf{R} | 7 \leq y \leq 9\}$
c) horizontal translation of 60; domain: $\{x \in \mathbf{R}\}$;
range: $\{y \in \mathbf{R} | -1 \leq y \leq 1\}$
d) vertical translation of -5; domain: $\{x \in \mathbf{R}\}$;
range: $\{y \in \mathbf{R} | -6 \leq y \leq -4\}$

2.

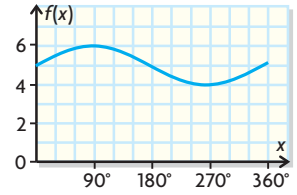


3. **a)** $f(x) = \sin(x + 70°) + 6$
b) amplitude: 1; period = 360°; axis: $y = 6$
c) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} \mid 5 \leq y \leq 7\}$

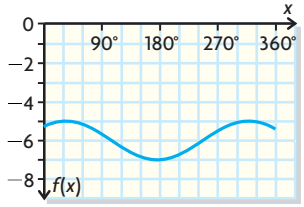
4. **a)** horizontal translation of 20



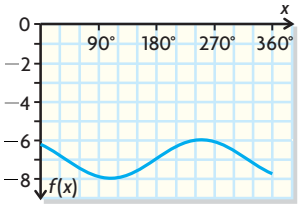
b) vertical translation of 5



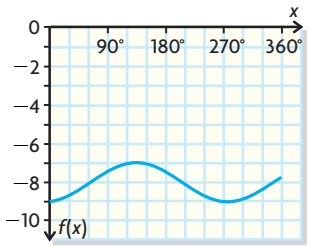
c) horizontal translation of 150 and a vertical translation of -6



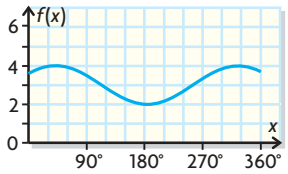
d) horizontal translation of -40 and a vertical translation of -7



e) horizontal translation of -30 and a vertical translation of -8



f) horizontal translation of -120 and a vertical translation of 3



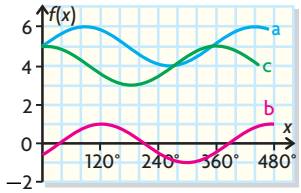
5. period, amplitude, and domain

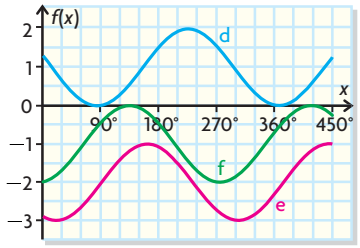
6. **a)** $f(x) = \sin(x - 15°) + 4$
b) $f(x) = \sin(x + 60°) - 7$
c) $f(x) = \sin(x - 45°) + 3$

7. $f(x) = \sin(x + 30°) - 5$

8. **a)** shifted vertically 4 units; shifted horizontally 90°
b) shifted vertically -3 units

9.





10. **a)** 360°
b) axis: $y = 1$; tire axle; vertical translation
c) 1; position of pebble above the ground
d) negative horizontal shift

11. **a)** same vertical transformation; same amplitude
b) The first is shifted horizontally $-45°$, and the other is horizontally shifted 90°.
c) The tires are the same size. The initial positions of the pebbles are different.

12. Answers may vary. E.g., $f(x) = \sin x + 4$; $f(x) = \sin(x - 90°) + 4$; $f(x) = \sin(x + 145°) + 4$

13.

Function	Horizontal Shift	Vertical Shift
$f(x) = \sin(x + 80)° - 7$	$-80°$ or 80° to the left	-7 units or 7 units down
$f(x) = \sin(x - 10)° + 3$	10° or 10° to the right	3 units or 3 units up
$f(x) = \sin(x + 25)° + 3$	$-25°$ or 25° to the left	9 units or 9 units up

14. If a number has been added or subtracted to the x-value, then there is a horizontal shift. If there is a number added or subtracted to the end of the funtion, then there is a vertical shift.

15. **a)** $f(x) = \sin(x + 45°) + 3$
b) $f(x) = \sin(x - 45°) - 2$

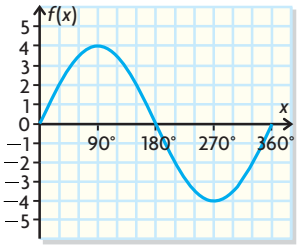
16. All three. $\sin(x - 90°) = \sin(x - 450°) = \sin(x - 810°)$

Lesson 6.6, pp. 373–376

1. **a)** amplitude 3 times larger
b) reflection in the x-axis; amplitude 2 times larger
c) amplitude 0.1
d) reflection in the x-axis; amplitude $\frac{1}{3}$

2. $f(x) = -5 \sin x$

3. **a)**



b) period: 360°; amplitude: 4; axis: $y = 0$
c) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -4 \leq y \leq 4\}$

4. **a)** vertical stretch
b) vertical compression
c) vertical compression
d) vertical stretch
e) vertical compression
f) vertical stretch

5. **a)** horizontal translation of $-20°$; vertical stretch of 3
b) reflection in the x-axis; vertical translation down 3
c) horizontal translation of 50°; vertical stretch of 5; vertical translation of -7
d) vertical stretch of 2; reflection in the x-axis; vertical translation of 6
e) horizontal translation of $-10°$; vertical stretch of 7; reflection in the x-axis
f) horizontal translation of 30°; vertical compression of 0.5; reflection in the x-axis; vertical translation of 1

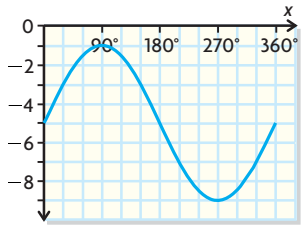
6. $f(x) = 3 \sin(x + 20)$:
a) amplitude = 3; period = 360°; axis: $y = 0$
b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -3 \leq y \leq 3\}$
$f(x) = -\sin x - 3$:
a) amplitude = 1; period = 360°; axis: $y = -3$
b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -4 \leq y \leq -2\}$
$f(x) = 5 \sin(x - 50) - 7$:
a) amplitude = 5; period = 360°; axis: $y = -7$
b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -12 \leq y \leq -2\}$
$f(x) = -2 \sin x + 6$:
a) amplitude = 2; period = 360°; $y = 6$
b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | 4 \leq y \leq 8\}$
$f(x) = -7 \sin(x + 10)$:
a) amplitude = 7; period = 360°; $y = 0$
b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -7 \leq y \leq 7\}$
$f(x) = -0.5 \sin(x - 30) + 1$:
a) amplitude = 0.5; period = 360°; axis: $y = 1$
b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | 0.5 \leq y \leq 1.5\}$

7. **a)** vertical stretch of 3; vertical translation of $+5$
b) vertical stretch of 2; reflection in the x-axis; vertical translation of -1

8. **a)** reflection in the x-axis **c)** horizontal translation
b) vertical stretch **d)** vertical translation

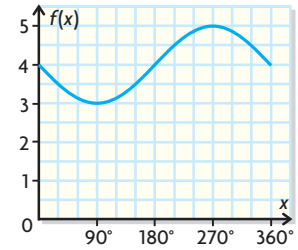
9. **a)** $f(x) = \sin(x - 135°) + 5$
b) $f(x) = \sin(x + 210°) - 7$

10. **a)**



b) $f(x) = 4 \sin x - 5$

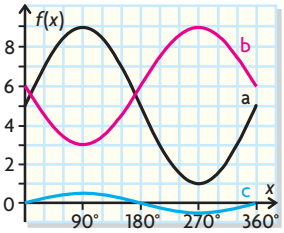
11. **a)**

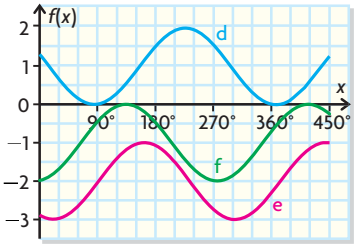


b) $f(x) = -\sin x + 4$

12. **a)** max: 3; min: −3 **c)** max: 10; min: 2
b) max: 2; min: −2 **d)** max: −2.5; min: −3.5

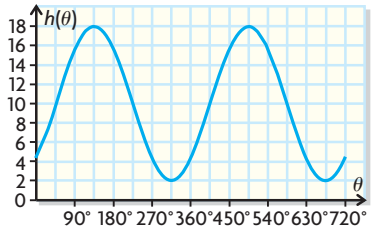
13.





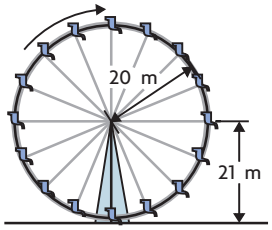
14. period

15. **a)** height of axle
b) vertical translation
c)



d) $\{y \in \mathbf{R} \mid 2 \leq y \leq 18\}$
e) 8; represents radius of Ferris wheel
f) 13.4 m

16.



17. **a)** h: $f(x) = 4 \sin x + 6$
k: $f(x) = -\sin x + 5$
f: $f(x) = \sin x$
g: $f(x) = -0.5 \sin x - 1$
b) horizontal stretch of $\frac{1}{2}$

18. You can shift the graph vertically and then horizontally and/or compress/stretch.

19. **a)** 720° **b)** 1440° **c)** 180° **d)** 36°

20. **a)** $y = 8$; height of axle
b) 6 m; length of windmill blade
c) 18 s; rotation speed of windmill
d) horizontal stretch
e) $y = 6 \sin(20(x - 4.5°)) + 8$
f) The period would be longer.
g) The graph would shift up 1 m.

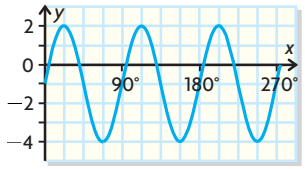
Chapter Review, pp. 378–379

1. **a)** yes
b) yes, once it reaches its constant speed
c) yes, assuming an ideal wave
d) yes

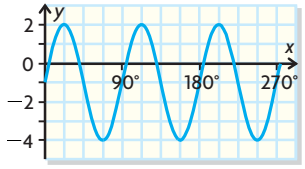
2. **a)** periodic **d)** 1.5 s
b) $\frac{1}{2}$ s **e)** The flat line would be longer.
c) 3 cm

3. **a)** −0.5 cm; makes sense because the function represents height relative to the ground, but it's digging and therefore below the ground
b) $y = 30$; height of axle on the rotating drum relative to the ground
c) 1 s; time for the drum to complete one full rotation
d) 35 cm; distance from the axle to the tip of the digging teeth

4.



5.

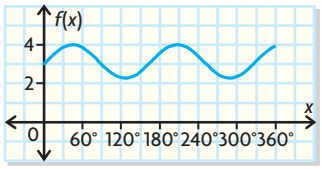


6. **a)** $\{d \in \mathbf{R} \mid -1.5 \leq d \leq 1.5\}$; $\{d \in \mathbf{R} \mid -0.5 \leq d \leq 0.5\}$
b) 0.02 s; 0.025 s; one is idling/vibrating faster than the other
c) $y = 0$ for both; resting position
d) 1.5 mm, 0.5 mm; how much they shake to the left and right of their resting positions

7. **a)** amplitude: 1; period: 360°; axis: $y = 3$; max: 4; min: 2

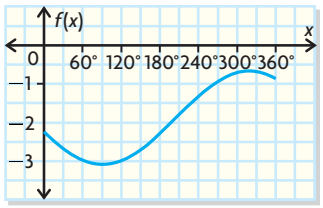
b) amplitude: 1; period: 360°; axis: $y = -2$; max: -1; min: -3

8. **a)**



domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | 2 \le y \le 4\}$

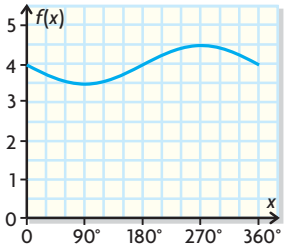
b)



domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -3 \le y \le -1\}$

9. **a)** $f(x) = -0.5 \sin x + 4$

b)



10. **a)** amplitude = 3; period = 360°; axis: $y = 0$; max: 3; min: -3

b) amplitude = 2; period = 360°; axis: $y = 0$; max: 2; min: -2

c) amplitude = 4; period = 360°; axis: $y = 6$; max: 10; min: 2

d) amplitude = 0.25; period = 360°; axis: $y = 0$; max: 0.25; min: -0.25

e) amplitude = 3; period = 360°; axis: $y = 0$; max: 3; min: -3

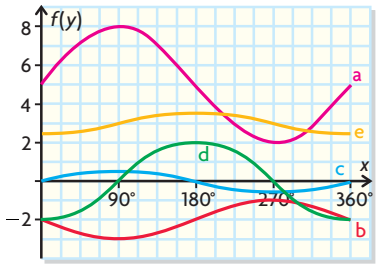
11. **a)** domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | 2 \le y \le 8\}$

b) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -3 \le y \le -1\}$

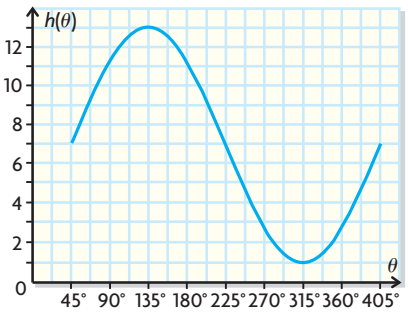
c) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -1.5 \le y \le -0.5\}$

d) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -2 \le y \le 2\}$

e) domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | 2.5 \le y \le 3.5\}$



12. **a)**



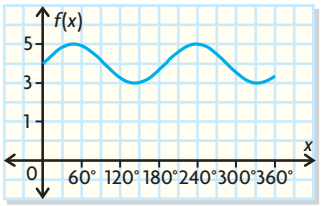
b) $\{h \in \mathbf{R} | 1 \le h \le 13\}$

c) 6; radius of Ferris wheel

d) 6.5 m

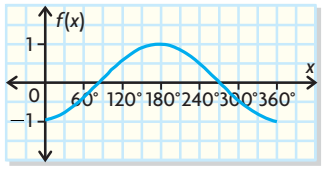
Chapter Self-Test, p. 380

1. **a)**



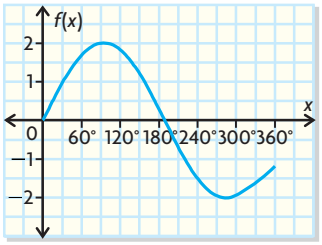
amplitude: 1; period: 360°; equation of the axis: $y = 4$; domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | 3 \le y \le 5\}$

b)



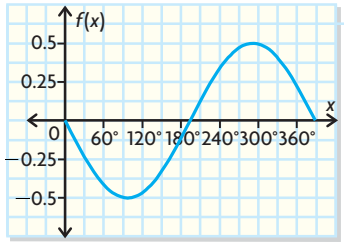
amplitude: 1; period: 360°; equation of the axis: $y = 0$; domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -1 \le y \le 1\}$

c)



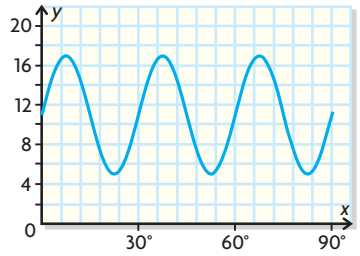
amplitude: 2; period: 360°; equation of the axis: $y = 0$; domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -2 \le y \le 2\}$

d)

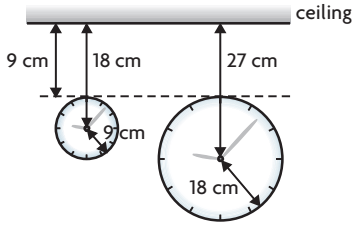


amplitude: 0.5; period: 360°; equation of the axis: $y = 0$; domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} | -0.5 \le y \le 0.5\}$

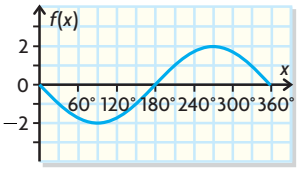
2.



3. **a)** period: 60 min for both; the amount of time it takes for the minute hand on each clock to make one complete revolution; axis: $y = 27$; $y = 18$; how far the centre of the clock face is away from the ceiling;
amplitude: 18 cm; 9 cm; length of the minute hands
b) pointing up at the 12
c) $\{d \in \mathbf{R} \mid 9 \leq d \leq 45\}$; $\{d \in \mathbf{R} \mid 9 \leq d \leq 27\}$
d) 22 cm for the smaller clock; 36 cm for the larger clock
e)

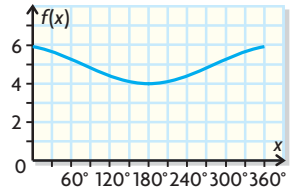


4. **a)** $f(x) = -2 \sin x$
b)



c) amplitude: 2; axis: $y = 0$; period: 360°; domain: $\{x \in \mathbf{R}\}$; range: $\{y \in \mathbf{R} \mid -2 \leq y \leq 2\}$

5.



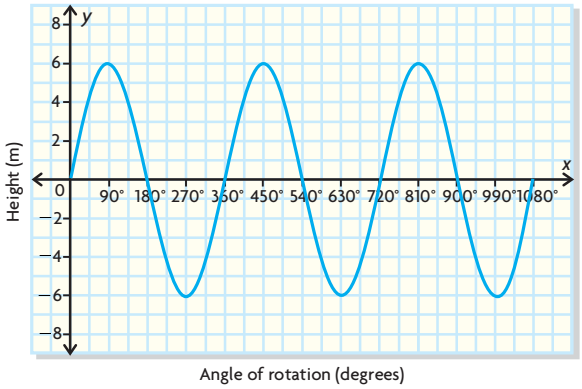
6. **a)** $f(x) = 4 \sin x$
b) $f(x) = -\sin x + 2$
c) $f(x) = -2 \sin x - 1$
d) $f(x) = 3 \sin x + 4$

Cumulative Review Chapters 4-6, pp. 382–385

1. (b)	**6.** (d)	**11.** (a)	**16.** (d)	**21.** (b)	**26.** (c)
2. (d)	**7.** (a)	**12.** (a)	**17.** (b)	**22.** (c)	**27.** (b)
3. (b)	**8.** (c)	**13.** (b)	**18.** (a)	**23.** (d)	**28.** (b)
4. (d)	**9.** (c)	**14.** (d)	**19.** (a)	**24.** (b)	**29.** (c)
5. (d)	**10.** (d)	**15.** (c)	**20.** (b)	**25.** (a)	

30. **a)** $f(x) = -0.0732x^2 + 45.75$
b) 6.24 m
31. **a)** 224.93 m **b)** 428.98 m **c)** 27.67°

32. **a)**



b) amplitude: 6 m; period: 1 revolution; axis $y = 0$; range: $\{y \in \mathbf{R} \mid -6 \leq y \leq 6\}$
c) The graph would be shifted to the right 0.25 revolutions. Also, from 0 revolutions to 0.25 revolutions, the height relative to the platform would go from −6 m to 0 m, and the shifted graph would end at 3 revolutions, not 3.25 revolutions.

Chapter 7

Getting Started, p. 388–390

1. **a)** (viii) **c)** (iii) **e)** (i) **g)** (ii)
b) (vi) **d)** (v) **f)** (iv) **h)** (vii)
2. **a)** 5.9 **b)** 7.8 **c)** 4.8 **d)** 6.7
3. **a)** $5 \times 5 \times 5 \times 5 = 625$
b) $(-4) \times (-4) \times (-4) = -64$
c) $-2 \times 2 = -4$
d) $(5 \times 2)(5 \times 2)(5 \times 2) = 1000$
e) $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$
4. **a)** 512 **c)** 15 625 **e)** 1024
b) 14 641 **d)** 361 **f)** 1024
5. **a)** 25 **c)** −8 **e)** 10 000
b) −25 **d)** −8 **f)** −10 000
6. **a)** −19 683 **c)** 6561 **e)** 729
b) −19 683 **d)** 6561 **f)** −729
7. **a)** −7 **c)** 2500 **e)** −200
b) 110 **d)** 400 **f)** −1
8. **a)** 9 **b)** 2 **c)** 3
9. **a)** $x = 4$ **c)** $y = 3$ **e)** $n = 3$
b) $m = 1$ **d)** $x = 3$ **f)** $c = 3$
10. **a)** $-\frac{5}{28}$ **c)** $\frac{5}{6}$ **e)** $\frac{2}{3}$
b) $\frac{35}{36}$ **d)** $1\frac{11}{12}$ **f)** $1\frac{4}{5}$
11. **a)** linear **b)** quadratic **c)** quadratic

Lesson 7.1, p. 394

1. The curve would eventually be the same as the room temperature.
2. **a)** It would take longer to cool down.
b) It would cool down much faster.