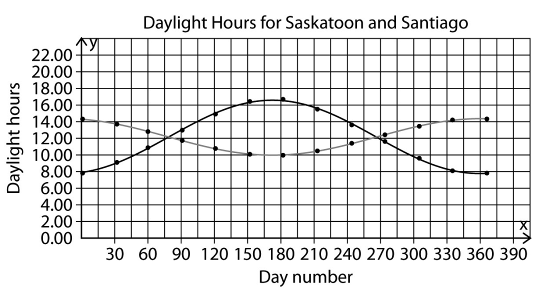
G. All of the locations have a midline at about the same place. There is only a 6 min difference between the lowest midline and the highest. This means that all the locations have an average day of about 12 h 10 min.
The Galapagos Islands have just over 12 h of daylight every day of the year. The hours of daylight remain fairly steady over the year. This makes sense, because the islands are nearly at the equator.
The hours of daylight vary for the other locations. Farther north of the equator, the amplitude of the sinusoidal function increases. Comparing the three Canadian locations, the farther north you go, the longer the days in summer and the shorter the days in winter. In Canada, as the hours of daylight fluctuate less, the weather becomes more temperate.
Santiago has the second-lowest variation in hours of daylight, with an amplitude of only 2.195. Since Santiago has the second-lowest amplitude of all five locations, I think its climate must be fairly temperate, with little fluctuation between winter and summer.

H. I graphed the hours of daylight for both locations on the same grid. This allowed me to compare the two cities more easily. I can see that the longest days in Saskatoon coincide with the shortest days in Santiago, and vice versa. This shows that the seasons are opposite. When we have winter in Canada, locations south of the equator have summer. Also, since the graph for Santiago has a smaller amplitude than the graph for Saskatoon, I think the weather in Santiago would be more temperate.



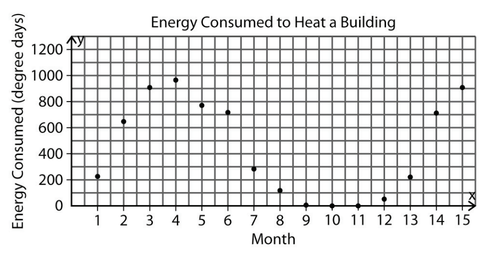
6-8 Cumulative Review, page 586

1. a) Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \in R\}$
x-intercepts: –3, –2, 2
y-intercept: –12
End behaviour: QIII to QI
b) Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \in R\}$
x-intercepts: –3, 1, 3
y-intercept: –9
End behaviour: QII to QIV

2. a) degree: 3
sign of leading coefficient: positive
constant term: –12
b) degree: 3
sign of leading coefficient: negative
constant term: –9

3. a) End behaviour: QIII to QI.
Number of turning points = degree – 1
Number of turning points = 1 – 1 = 0
Number of possible x-intercepts: 1
y-intercept: the y-intercept is the constant term, –2
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \in R\}$
b) End behaviour: QIII to QIV
Number of turning points = degree – 1
Number of turning points = 2 – 1 = 1
Number of possible x-intercepts: 0, 1, or 2
y-intercept: the y-intercept is the constant term, –8
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \leq -4, y \in R\}$
c) End behaviour: QIII to QI
Number of turning points = degree – 1
Number of turning points = 3 – 1 = 2
Number of possible x-intercepts: 1, 2, or 3
y-intercept: the y-intercept is the constant term, –2
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \in R\}$
d) End behaviour: QII to QIV
Number of turning points = degree – 1
Number of turning points = 3 – 1 = 2
Number of possible x-intercepts: 1, 2, or 3
y-intercept: the y-intercept is the constant term, 0
Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y \in R\}$

4. a) The cubic regression function is
$y = 4.808\ldots x^3 - 106.412\ldots x^2 + 597.473\ldots x - 163.802\ldots$

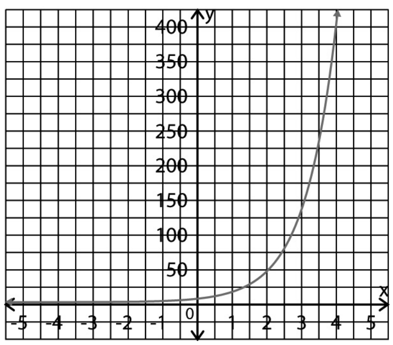


b) e.g., from halfway through month 8 to three quarters of the way through month 13.
c) e.g., 274 degree days, there are 31 days in the seventh month, so $x = 8 - \frac{1}{31}$.

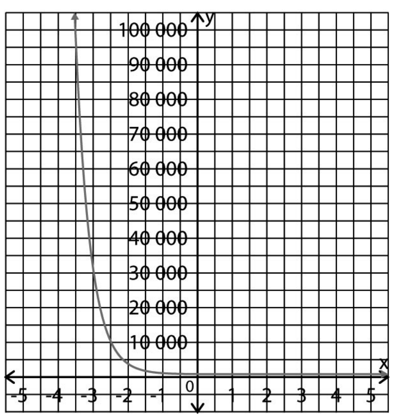
5.

	a)	**b)**
Number of *x*-intercepts	0	0
***y*-intercept**	5	30
End Behaviour	QII to QI	QII to QI
Domain	$\{x \mid x \in R\}$	$\{x \mid x \in R\}$
Range	$\{y \mid y > 0, y \in R\}$	$\{y \mid y > 0, y \in R\}$
Increasing or Decreasing?	Increasing	Decreasing

a)



b)

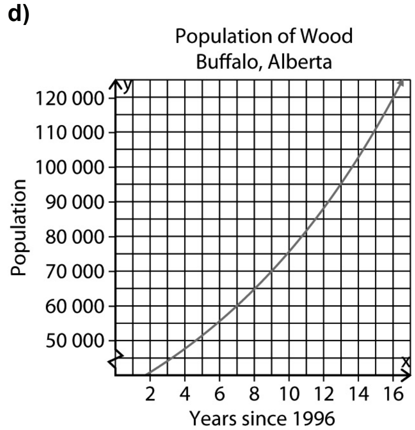


6. a)

Year	Population
1996	35 000
1997	37 800
1998	40 824
1999	44 090
2000	47 617
2001	51 426
2002	55 541
2003	59 984
2004	64 783
2005	69 965
2006	75 562

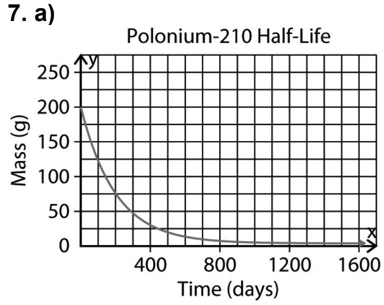
b) e.g., The rate of growth is constant, and growth occurs rapidly.
c) The *y*-intercept is 35 000, and it represents the initial population (in 1996).

d)



i) The population is approximately 111 025 in 2011.
ii) The population should exceed 100 000 in approximately the middle of July 2009.

7. a)



b) 5 years is 1829 days, $t = 1829$:

$$M(1829) = 200\left(\frac{1}{2}\right)^{\frac{1829}{138}}$$

$$M(1829) = 200\left(\frac{1}{2}\right)^{13.253...}$$

$$M(1829) = 200(0.000102...)$$

$$M(1829) = 0.020...$$

A mass of about 0.02 g remains after five years.

c) $M(t) = 50$ g

$$50 = 200\left(\frac{1}{2}\right)^{\frac{t}{138}}$$

$$0.25 = (0.5)^{\frac{t}{138}}$$

$$\log(0.25) = \log\left[(0.5)^{\frac{t}{138}}\right]$$

$$\log(0.25) = \left(\frac{t}{138}\right)\log(0.5)$$

$$\left(\frac{t}{138}\right) = \frac{\log(0.25)}{\log(0.5)}$$

$$t = (138)\frac{\log(0.25)}{\log(0.5)}$$

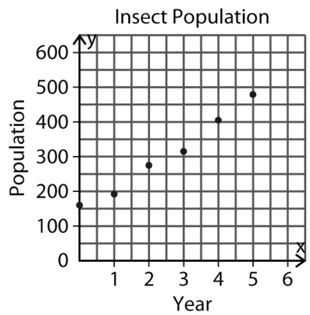
$$t = 138(2)$$

$$t = 276$$

The sample would decay to 50 g in 276 days.

8. a)

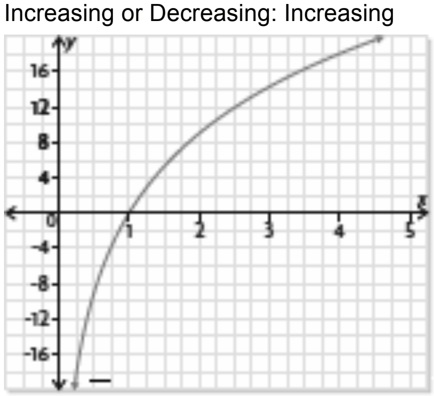
Year (t)	0	1	2	3	4	5
Population $P(t)$	160	192	275	315	405	479



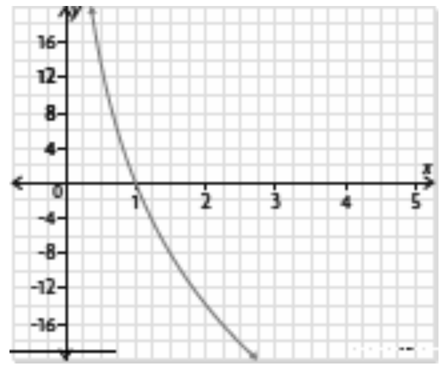
b) Using a graphing calculator, the equation is $P(t) = 161.581…(1.251…)^t$.
c) e.g., a represents the initial population, 161.581…, b represents the growth rate, 1.251… and $P(t)$ is the population after t years.
d) The population will exceed 1000 in about 8 years.

9. a) x-intercept: 1
number of y-intercepts: none
End Behaviour: QIV to QI
Domain: $\{x \mid x > 0, x \in R\}$
Range: $\{y \mid y \in R\}$

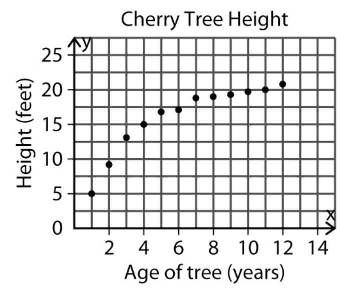
10. a) x-intercept: 1
y-intercept: none
End Behaviour: QIV to QI
Domain: $\{x \mid x > 0, x \in R\}$
Range: $\{y \mid y \in R\}$
Increasing or Decreasing: Increasing



b) x-intercept: 1
y-intercept: none
End Behaviour: QI to QIV
Domain: $\{x \mid x > 0, x \in R\}$, Range: $\{y \mid y \in R\}$
Increasing or Decreasing: decreasing



11. a)



Age of Tree (years)	Height (feet)
1	5.0
2	9.2
3	13.1
4	15.0
5	16.8
6	17.1
7	18.8
8	19.0
9	19.3
10	19.7
11	20.0
12	20.8

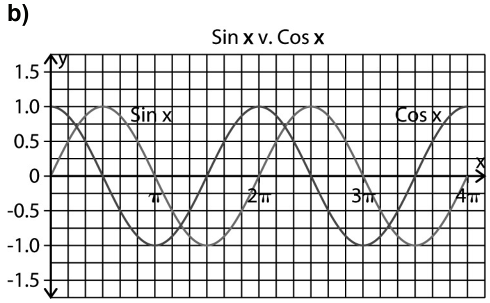
b) The logarithmic regression function that models the tree's growth is
$y = 6.357… \ln x + 5.561…$
c) $x = 15$

$$y = 6.357...\ln x + 5.561...$$
$$y = 6.357...\ln(15) + 5.561...$$
$$y = 22.777...$$

The height of the tree when it is 15 years old is 22.8 ft.
d) $y = 12$
The age of the tree is 2.758… or 2.8 years old when it is 12 ft.
12. a) The common characteristics of $y = \sin x$ and $y = \cos x$ are:
Number of x-intercepts: multiple
$y = \sin x$ y-intercept: 0
$y = \cos x$ y-intercept: 1
Domain = $\{x \mid x \in R\}$
Range = $\{y \mid -1 \le y \le 1, y \in R\}$
Period = 360° or 2π
Amplitude = 1

Equation of midline: $y = 0$

b)



13. a) Maximum = 11 m
Minimum = 1 m
Range = $\{y \mid 1 \le y \le 11, y \in R\}$
Equation of midline:

$$y = \frac{\text{max} + \text{min}}{2}$$

$$y = \frac{11 + 1}{2}$$

$$y = \frac{12}{2}$$

$$y = 6$$

$$\text{Amplitude} = \frac{\text{max} - \text{min}}{2}$$

$$\text{Amplitude} = \frac{11 - (1)}{2}$$

$$\text{Amplitude} = \frac{10}{2}$$

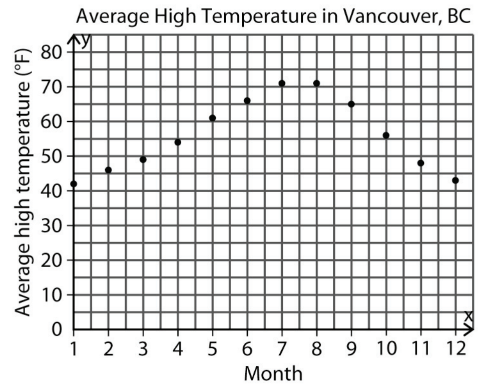
$$\text{Amplitude} = 5$$

Period = second max – first max
Period = 100 – 10
Period = 90 s
The range of the graph is $\{y \mid 1 \le y \le 11, y \in R\}$. The equation of the midline is $y = 6$ m. The amplitude is 5 m, and the period is 90 s.
b) e.g., The Ferris wheel starts 1 m off the ground and over 90 s rotates to 11 m and back. The axis of the wheel is 6 m off the ground and the wheel has a radius of 5 m.

14.

Function	**a)** $y = \sin 4(x - 30°) + 2$	**b)** $y = 5 \cos (x + 4) - 2$
Amplitude	3	5
Period	90°	2π
Equation of Midline	$y = 2$	$y = -2$
Domain	$\{x \mid x \in R\}$	$\{x \mid x \in R\}$
Range	$\{y \mid -1 \le y \le 5, y \in R\}$	$\{y \mid -7 \le y \le 3, y \in R\}$
Horizontal Translation	30° to the right	4 to the left

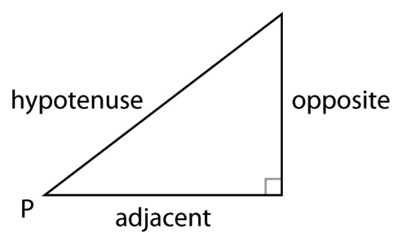
15. a)



e.g., Assuming this pattern continues year after year, it makes sense because temperature is related to seasons which follow a yearly cycle. The average monthly temperatures should be relatively consistent from year to year.
b) The sinusoidal regression function that models this relationship is
$y = 13.983\ldots \sin(0.551\ldots x - 2.363\ldots) + 56.662\ldots$
c) Assume that the average temperature occurs in the middle of the month. Taking the middle of July to be $x = 7.0$:
$y = 70.603\ldots$
It is 70.6 °F.
d) e.g., Looking at the graph, I estimate the average high temperature in Vancouver will be greater than 60 °F from early May to early October.

Chapter 8 Diagnostic Test, TR page 533

1.



2. $\sin \angle A = \frac{3}{5}$

$\cos \angle A = \frac{4}{5}$

3. a) Domain: $\{x \mid x \in R\}$
Range: $\{y \mid y > 0, y \in R\}$
b) Domain: $\{x \mid x > 0, x \in R\}$
Range: $\{y \mid y \in R\}$

4. a) The minimum value is –3.
b) The maximum value is 39.
c) The y-coordinates of the turning points are –5.0 and 16.9.