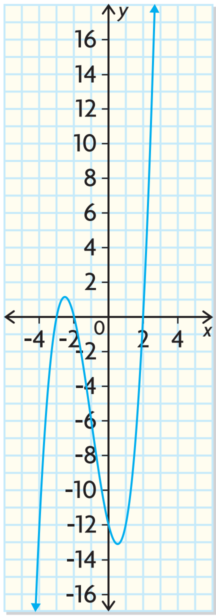
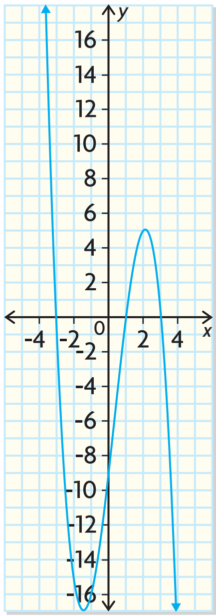
6-8 Cumulative Review

1. Determine the x-intercepts, the y-intercept, the end behaviour, the domain, and the range for each function shown.

a)



b)



2. Determine the degree, the sign of the leading coefficient, and the constant term of the equation of each polynomial function shown in question 1.

3. Determine the possible number of x-intercepts, the y-intercept, the end behaviour, the possible number of turning points, the domain, and the range of each function.
   a) $f(x) = 6x - 2$
   b) $v(x) = -x^2 + 4x - 8$
   c) $u(x) = 2x^3 + 2x^2 - 2x - 2$
   d) $w(x) = -x^3 + 5x$

4. The amount of energy consumed to heat a building on the first day of each month over 15 months is shown in the table.
   a) Create a scatter plot and determine the equation of the cubic regression function that models the data.
   b) Use your graph to estimate the time period when the energy consumed to heat the building is less than 150 degree days
   c) Use your cubic regression equation to determine the degree days needed to heat the building on the day that corresponds to the end of the seventh month. State any assumptions you made.

Month	Energy Consumed (degree days)
1	226
2	647
3	908
4	965
5	771
6	717
7	283
8	118
9	6
10	0
11	0
12	52
13	221
14	712
15	908

5. Predict the characteristics of each exponential function. Record your predictions in a table like the one shown on the top of the next page. Verify your predictions using graphing technology.
   a) $y = 5(3)^x$
   b) $y = 30(0.1)^x$

Number of x-Intercepts	y-Intercept	End Behaviour	Domain	Range	Increasing or Decreasing?

6. The population of the regional municipality of Wood Buffalo, Alberta, has grown rapidly since the discovery of one of the world's largest oil deposits. Its population in 1996 was 35 000 and has grown since at an annual rate of 8%.

a) Create a table of values that shows the population of Wood Buffalo from 1996 to 2006.

b) How do you know that an exponential function can be used to model this context?

c) The exponential function that models the population growth of Wood Buffalo is

$$y = 35\,000(1.08)^x$$

where x represents the time in years and y represents the population. Determine the y-intercept of this function. What does it represent in this context?

d) Graph the function. Use the graph to estimate

i) The population in 2011.

ii) When the population exceeded 100 000.

7. A 200 g sample of radioactive polonium-210 has a half-life of 138 days. The mass of polonium, in grams, that remains after t days can be modelled by the exponential function

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

a) Create a graph of the function.

b) Determine the mass that remains after 5 years.

c) Determine the length of time needed for the sample to decay to 50 g.

8. A biologist tracks the population of an insect in a controlled environment over several years.

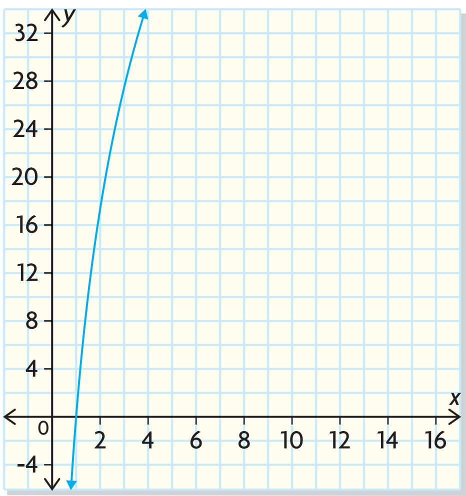
Year (t)	0	1	2	3	4	5
Population $P(t)$	160	192	275	315	405	479

a) Create a scatter plot for the data.

b) Determine the equation of the exponential regression function that models the insect's population growth.

c) Explain how the parameters in the equation are related to the context.

d) Determine when the population will exceed 1000.



9. Shown is the graph of $y = 25 \log x$. State the x-intercept, the number of y-intercepts, the end behaviour, the domain and the range.

10. Predict the characteristics of each logarithmic function by stating

- the x-intercept
- the y-intercept
- the end behaviour
- the domain
- the range
- whether the function increases or decreases.

Verify your predictions by graphing each function.

a) $y = 30 \log x$ **b)** $y = -20 \ln x$

11. Martin is a fruit grower in the Okanagan Valley. He has planted and tracked the growth of a new variety of cherry tree he is considering planting on 10 acres of his farm.

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

a) Create a scatter plot for the data.
b) Determine the equation of the logarithmic regression function that models the tree's growth.
c) Determine the height of a tree of this variety when it is 15 years old.
d) Determine the age of a tree of this variety when it is 12 feet tall.

12. **a)** Name these common characteristics of the graphs of

$$y = \sin x \text{ and } y = \cos x:$$

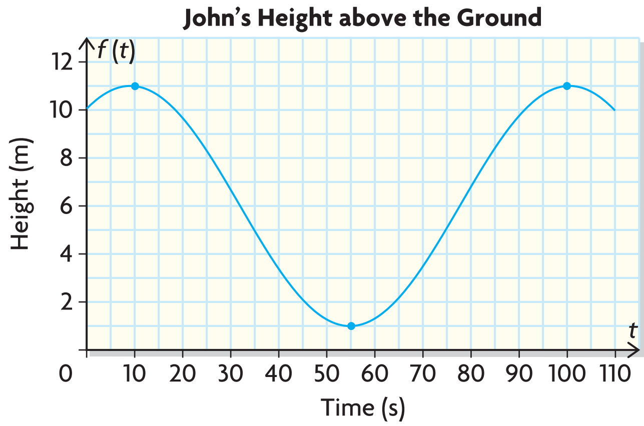
- the number of x-intercepts
- the y-intercept
- the domain
- the range
- the period
- the amplitude
- the equation of the midline

b) Sketch the graphs of both functions on the same axis where $\{x \mid 0 \leq x \leq 4\pi, x \in \mathrm{R}\}$.

13. A group of students is tracking a friend, John, as he rides a ferris wheel. They created a graph that shows his height above the ground at various times on his ride.

a) Describe this graph by determining its range, the equation of its midline, its amplitude, and its period.

b) Discuss how these characteristics of the graph are related to the ferris wheel.



14. For each of the following sinusoidal functions, state the amplitude, the period, the equation of the midline, the domain, the range, and the horizontal translation.

a) $y = 3 \sin 4(x - 30°) + 2$ **b)** $y = 5 \cos (x + 4) - 2$

15. The average high temperature for each month in Vancouver, British Columbia, is shown in the following table. Month 1 represents January and Month 12 represents December.

Month Number	Average High Temperature (°F)
1	42
2	46
3	49
4	54
5	61
6	66
7	71
8	71
9	65
10	56
11	48
12	43

a) Create a scatter plot for the data. Why does assuming that this pattern repeats year after year make sense?

b) Determine the equation of the sinusoidal regression function that models the relationship between the month of the year and average high temperature.

c) Determine the average high temperature in Vancouver in the middle of July.

d) Estimate when the average high temperature in Vancouver will be greater than 60 °F.