KEY CONCEPTS

- A logarithm can be expressed in terms of base 10 using the change of base formula:
  $\log_b m = \frac{\log m}{\log b}, b > 0, b \neq 1, m > 0$
  This change of base formula can be used to evaluate logarithms or to graph logarithmic functions with any base using technology.
- Many problems based on real-world applications that can be modelled with exponential equations can be solved algebraically by rewriting them in logarithmic form. Logarithms are used to determine the exponent in an exponential equation.
- There are many applications of logarithms in business, such as compound interest, and in the sciences, such as the pH scale, decibel scale, and Richter scale.

Example

a) Evaluate $\log_{15} 20$. Round your answer to three decimal places.

b) Solve $2 = 1.04^t$ for t, to two decimal places.

c) Graph the function $f(x) = \log_4 x$ using a graphing calculator.

Solution

a) $\log_{15} 20 = \frac{\log 20}{\log 15}$
$\doteq 1.106$

b) $2 = 1.04^t$
$t = \log_{1.04} 2$
$t = \frac{\log 2}{\log 1.04}$
$t \doteq 17.67$

c) $f(x) = \log_4 x$
$= \frac{\log x}{\log 4}$