Name: _____ Date: _____

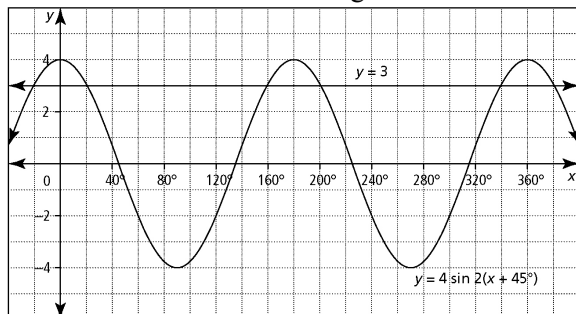# Section 5.4 Extra Practice

1. The partial graphs of the functions
   $y = 4\sin 2(x + 45°)$ and the line $y = 3$ are
   shown. Determine the solutions to the
   equation $4\sin 2(x + 45°) = 3$ over the
   interval $0° \le x \le 360°$. Express your
   answers to the nearest degree.

2. For each situation, state a possible domain
   and range. Then, state the period of each
   function to the nearest tenth of a unit.

   a) The motion of a point on an industrial
      flywheel can be described by the formula
      $$h(t) = 13\cos \frac{2\pi}{0.7}t + 15,$$ where h is height,
      in metres, and t is the time, in seconds.

   b) The fox population in a particular region
      can be modelled by the equation
      $$F(t) = 500\sin \frac{\pi}{12}t + 1000,$$ where F is
      the fox population and t is the time,
      in months.

3. In a 365-day year, a sinusoidal equation
   of the form $f(x) = a\cos b(x - c) + d$ can
   be used to graphically model the time of
   sunrise or sunset throughout the year, where
   $f(x)$ is the time of the day in decimal time
   format, and x is the day of the year. The
   sunrise and sunset times for Yellowknife are
   provided in the table.

	June 21 (172nd day of the year)	Dec 21 (355th day of the year)
Sunrise	2:34 a.m.	10:11 a.m.
Sunset	10:45 p.m.	3:00 p.m.

   a) Write an equation that models the time of
      sunrise in Yellowknife.

   b) Write an equation that models the time of
      sunset in Yellowknife.

4. At the bottom of its rotation, the tip of the
   blade on a windmill is 8 m above the
   ground. At the top of its rotation, the blade
   tip is 22 m above the ground. The blade
   rotates once every 5 s.

   a) Draw one complete cycle of this
      scenario.

   b) A bug is perched on the tip of the blade
      when the tip is at its lowest point.
      Determine the cosine equation of the
      graph for the bug's height over time.

   c) What is the bug's height after 4 s?

   d) For how long is the bug more than 17 m
      above the ground?

5. The average daily maximum temperature in
   Edmonton follows a sinusoidal pattern over
   the course of a year (365 days). Edmonton's
   highest temperature occurs on the 201st day
   of the year (July 20th) with an average high
   of 24 °C. Its coldest average temperature
   is −16 °C, occurring on January 14.

   a) Write a cosine equation for Edmonton's
      temperature over the course of the year.

   b) What is the expected average temperature
      for August 4th?

   c) For how many days is the average
      temperature higher than 20 °C?

6. The pendulum of a grandfather clock
   swings with a periodic motion that can be
   represented by a trigonometric function.
   At rest, the pendulum is 16 cm above the
   base. The highest point of the swing is
   20 cm above the base, and it takes 2 s for
   the pendulum to swing back and forth once.
   Assume that the pendulum is released from
   its highest point.

   a) Write a cosine equation that models
      the height of the pendulum as a function
      of time.

   b) Write a sine equation that models the
      height of the pendulum as a function
      of time.