

## Check Your Understanding - Transformations of Sinusoidal Functions

Answer the following questions on our own paper.

1. The mapping rule below describes the transformed sine function,  $h(x)$ .

$$(x, y) \rightarrow (3x - 45^\circ, -8y + 10)$$

- Write the equation of  $h(x)$ .
  - Describe the transformations applied to the parent sine function.
2. Write the equation of the transformed cosine function,  $g(x)$ , that has the characteristics listed below.

- equation of the sinusoidal axis:  $y = -6$
- phase shift:  $30^\circ$  right
- period:  $120^\circ$
- amplitude: 10

3. Given:  $\frac{1}{2}(y - 8) = \cos\left(\frac{1}{2}x - 45^\circ\right)$

Determine the amplitude, phase shift, and the period of the given function.

4. One of the main food sources for the Arctic fox is the lemming. Suppose the population,  $L$ , of lemmings in a region of northern Manitoba is modelled by the function



$$L(t) = 5000 \sin\left[\frac{\pi}{12}(t - 12)\right] + 10000$$

where  $t$  is the time, in months.

Determine the maximum and minimum number of lemmings.

5. A stuffed bunny is attached to the end of a vertical spring. The bunny is pulled down and then released. The bunny begins to oscillate on the end of the spring. Assume you start a stopwatch. When the watch reads 6 s, the bunny is at a minimum height of 20 cm above the floor. At 12 s, the bunny is at a maximum height of 70 cm above the floor.



- Draw a graph of the bunny's height above the floor with respect to time on graph paper (if possible). *Show at least two complete cycles of this motion.*
  - What is the period and what does it represent in this situation?
  - What is the amplitude and what does it represent in this situation?
  - What is the equation of the sinusoidal axis and what does it represent in this situation?
6. Given:  $h(x) = -8 \sin[2(x + 30^\circ)] - 4$
- State the equation of the parent function,  $f(x)$ .
  - Write a mapping rule describing the transformations applied to the parent function.
  - Graph at *least two cycles* of function  $h(x)$  on the graph paper provided. **As part of your solution, include a table of values containing five image points.**
  - Complete the table for  $h(x)$ .

Characteristic	Answers
Maximum Value	
Minimum Value	
Amplitude	
Period	
Equation of the Sinusoidal Axis	
Phase Shift	
Domain	
Range	