**ADLC** | Alberta Distance Learning Centre

# Unit 8: Sinusoidal Functions
# Unit Assignment

Read the course material and complete the practice questions and suggested textbook questions throughout the Unit content before working on this Unit Assignment. The following chart shows you which lesson to review if you're having difficulty with the questions in this assignment booklet.

| Unit Assignment Question | Lesson |
|---|---|
| 1, 2, 3, 5 | 8A |
| 4, 6, 7 | 8B |
| 8 | *Logic and Reasoning |

*Contact your teacher if you need help with Logic and Reasoning.

**For full marks, show all calculations, steps, and/or explain your answers.**

**Total Marks: _____ /43**

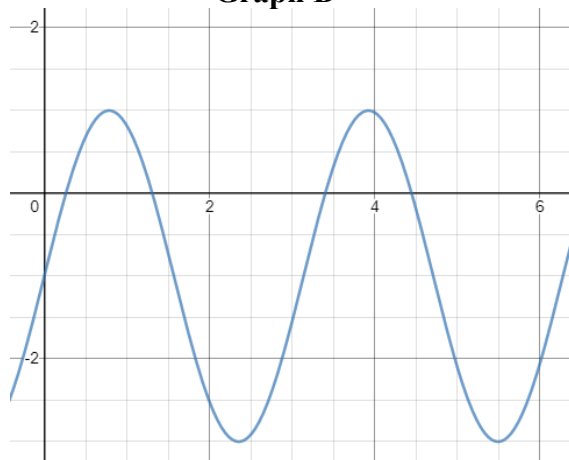1.  Complete the table by determining the following characteristics of each function. (8 marks)

| Equation | Amplitude | Period | Horizontal Translation | Midline |
|---|---|---|---|---|
| $y = \sin(x-3)+1$ | | | | |
| $y = 6\sin 0.25(x+45°)-9$ | | | | |
| $y = 2\sin 8(x+3)+5$ | | | | |
| $y = 0.75\sin 4(x-60°)$ | | | | |

2.  Match each graph with the corresponding equation in the chart. Give **at least two reasons** for each answer.
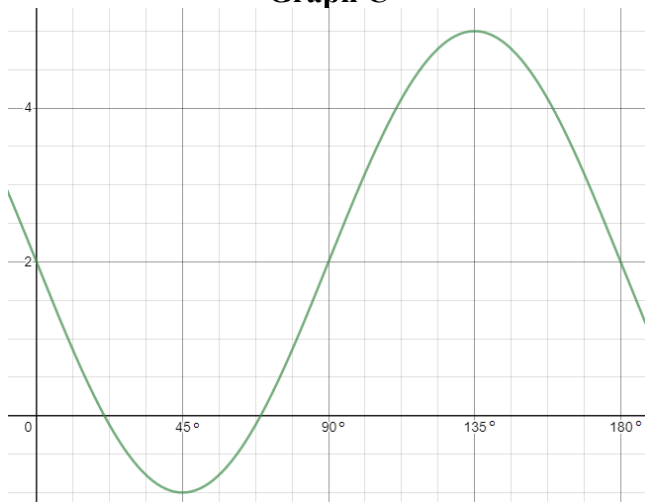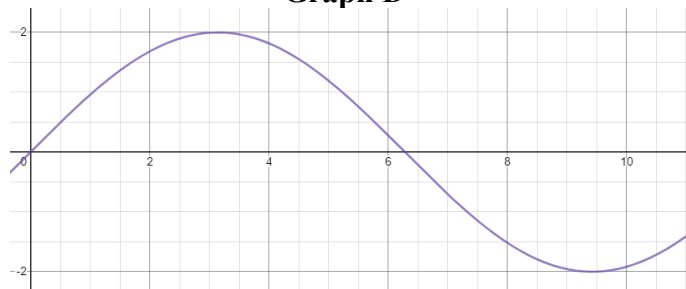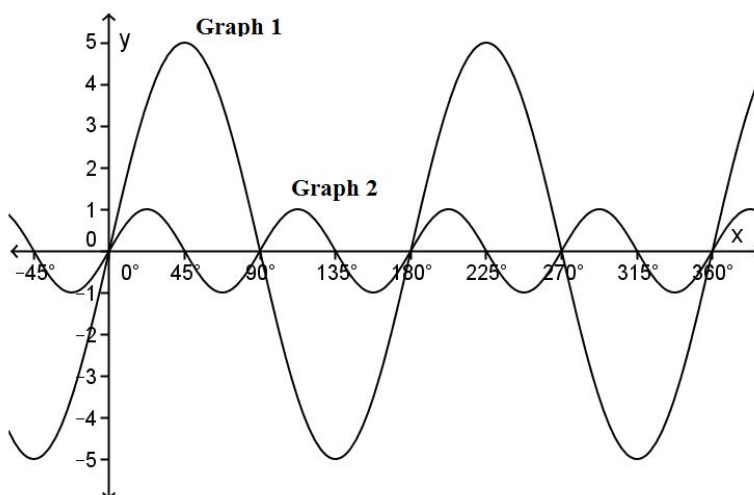
**Graph A**
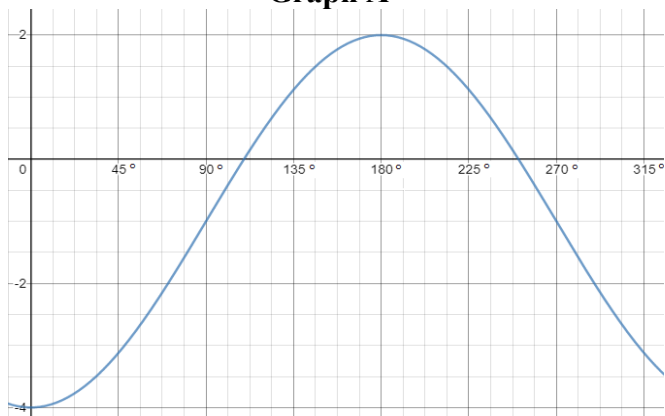


**Graph B**



**Graph C**



**Graph D**



| Equation | Graph (4 marks) | Reasons (4 marks) |
|---|---|---|
| $y = 2\sin 0.5x$ | | |
| $y = 3\sin 2(x + 90°) + 2$ | | |
| $y = 3\sin(x - 90°) - 1$ | | |
| $y = 2\sin 2x - 1$ | | |

3.  The graphs of two sine functions are shown below.



Compare the values of the parameters $a$, $b$, $c$, and $d$ for both graphs. Which would be the same and which would be different? Explain your answers. (4 marks)

4.  Determine if each of the following tables is best represented by a sinusoidal regression equation. Justify your answer. (2 marks – 0.5 marks each)

Table 1:

| $x$ | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | -6 | -4 | -2 | 0 | 2 | 4 | 6 |

Table 2:

| $x$ | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | 9 | 4 | 1 | 0 | 1 | 4 | 9 |

Table 3:

| $x$ | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | 0.125 | 0.25 | 0.5 | 1 | 2 | 4 | 8 |

Table 4:

| $x$ | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | 0 | -4.5 | -4.5 | 0 | 4.5 | 4.5 | 0 |

5. The Niagara SkyWheel is a Ferris wheel in Niagara Falls, Ontario. Instead of seats, visitors ride in capsules which they enter and exit at the lowest point of the ride. The graph below models the height of a particular capsule over the course of a ride.
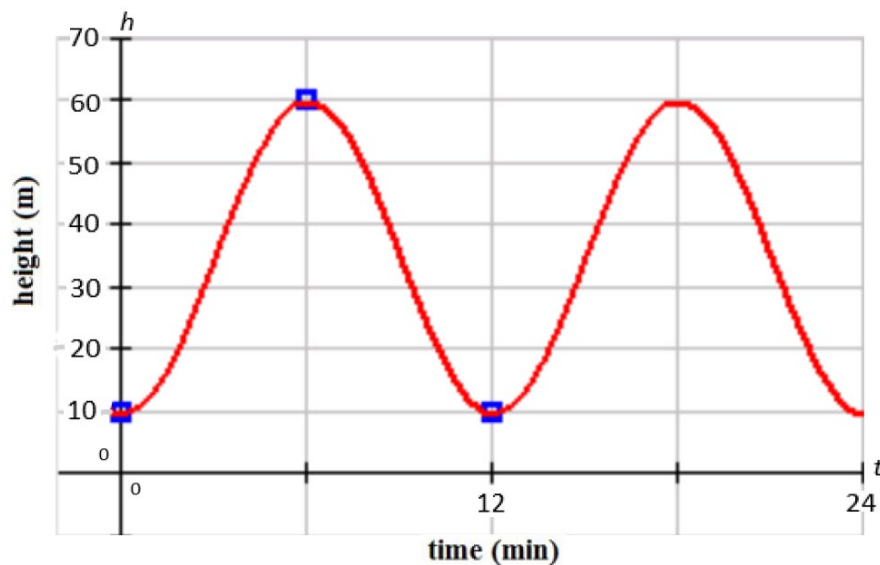


a.  State the value of each characteristic of the graph above and explain what it represents in the context of the question.

i)   amplitude (2 marks)

ii)  period (2 marks)

iii) y-intercept (2 marks)

iv)  midline (2 marks)

v)   range (2 marks)

b.  Determine the equation of a function in the form $h = a\sin(bt - 1.57) + d$, where $h$ represents the height, in metres, of a rider above the ground, and t represents the time, in minutes, after the ride has started. Express the values of $a$, $b$, and $d$ to the nearest hundredth, if necessary. (2 marks)

6.  Each evening at sunset, the lights on the Niagara SkyWheel are turned on. The time of the sunset in Niagara can be modelled by the equation
$$s = 2.891\sin(0.016d - 1.183) + 18.512$$
where $s$ is the time of the sunset, and $d$ is the day of the year.

a.  Use the equation to determine the time of day that the sun sets on July 19th, which is day 200. (2 marks)

b.  On how many days of the year, to the nearest whole number, will the lights be turned on at 7 PM (19:00) or later? (2 marks)

7. The table below provides the average monthly temperature in Niagara, Ontario over the course of a year.

| | Month | Temperature $^{\circ}$C |
|---|---|---|
| 1 | January | -0.4 |
| 2 | February | 1.3 |
| 3 | March | 5.9 |
| 4 | April | 12.8 |
| 5 | May | 19.4 |
| 6 | June | 24.5 |
| 7 | July | 27.4 |
| 8 | August | 26 |
| 9 | September | 21.9 |
| 10 | October | 15.1 |
| 11 | November | 8.7 |
| 12 | December | 2.7 |

a. Determine the equation of a sinusoidal regression function that best models the data. Express the values of a, $b$, $c$, and $d$ to the nearest hundredth. (1 mark)

b. Use the sinusoidal regression equation above to predict the average temperature, to the nearest hundredth, in Niagara next February. (1 mark)

c. Most tourists visit Niagara during months when the average temperature is 17 $^{\circ}$C and higher. Determine the month of the year when the temperature first reaches 17 $^{\circ}$C. (1 mark)

8.    Pattern or Game Question: Magic Square

      Arrange the numbers 1 to 9 in the magic square below so that each horizontal, vertical, and diagonal line adds to 15. You may only use each number once. (2 marks)

|  |  |  |
|---|---|---|
|  |  |  |
|  |  |  |
|  |  |  |

**End of Assignment**