

Graphing Waves: Sine and Cosine Models

Grade 11 – Algebra 2 math · Test · Standards: F-TF.B.5, F-IF.C.7e

Name: _____ Date: _____ Class: _____

This 45-minute test covers features of trigonometric graphs, equations from graphs and tables, and models of periodic situations. A calculator is allowed. Show each step.

Standards: F-TF.B.5, F-IF.C.7e · **Level:** Grade 11 Algebra 2

Time: 45 minutes · 9 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Features of a sine function (3 points)

For $y = -3 \sin(4x) + 2$, state

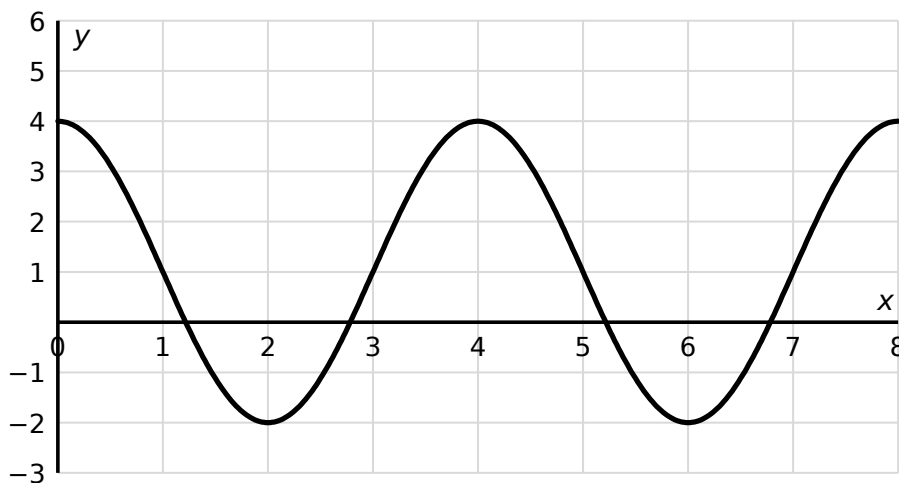
- the amplitude (1 point)
- the period (1 point)
- the midline, maximum and minimum (1 point)

Question 2 Phase shift and range (2 points)

For $y = 2 \cos(x + \pi/3) - 1$, state the phase shift and the range.

Question 3 Equation from a graph (3 points)

The graph shows a cosine function.



Graph for Question 3.

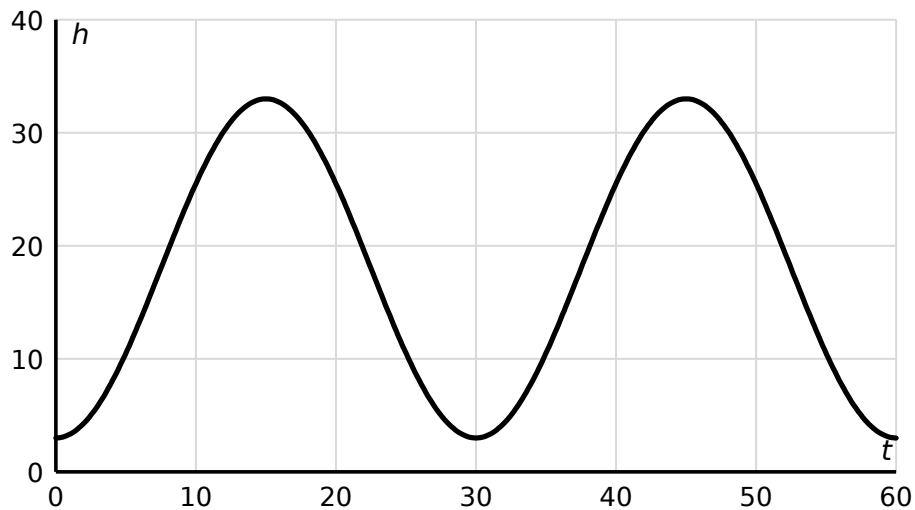
Write its equation in the form $y = A \cos(Bx) + D$. (3 points: D, A, B)

Question 4 Write a model (2 points)

Write a cosine function with maximum 11 at $x = 0$, minimum -3 , and period 8.

Question 5 Ferris wheel (3 points)

A Ferris wheel of radius 15 feet has its center 18 feet above the ground and completes one rotation every 30 seconds. The height of a rider who starts at the bottom is $h(t) = -15 \cos(\pi t/15) + 18$.



Graph for Question 5.

- a. Find $h(0)$. (1 point)
- b. Find $h(10)$. (1 point)
- c. When is the rider first at the top? (1 point)

Question 6 Tide depth (2 points)

The depth of water at a dock is $d(t) = 2 \cos(\pi t/6) + 7$ feet, t in hours after high tide. Find the high-tide depth, the low-tide depth, and the depth at $t = 2$.

Question 7 Maximum points (2 points)

Find the x -coordinates of all maximum points of $y = 4 \sin 3x$ on $[0, \pi]$.

Question 8 Model from a table (2 points)

A table shows values of a sine-type function: $(0, 5)$, $(2, 8)$, $(4, 5)$, $(6, 2)$, $(8, 5)$. Write an equation of the form $y = A \sin(Bx) + D$.

Question 9 Maximum of a reflected cosine (1 point)

State the maximum value of $y = -2 \cos x + 3$ and the smallest positive x where it occurs.