

Graphing Sine, Cosine and Tangent Functions

Grade 12 – Precalculus math · Test · Standards: F-TF.B.5, F-IF.C.7e, F-BF.B.3

Name: _____ Date: _____ Class: _____

This 45-minute test has 8 questions worth 20 points. It covers features of sinusoids, equations from graphs and data, tangent graphs, and solving for times in a model. Show each step so partial credit can be awarded.

Standards: F-TF.B.5, F-IF.C.7e, F-BF.B.3 · **Level:** Grade 12 Precalculus

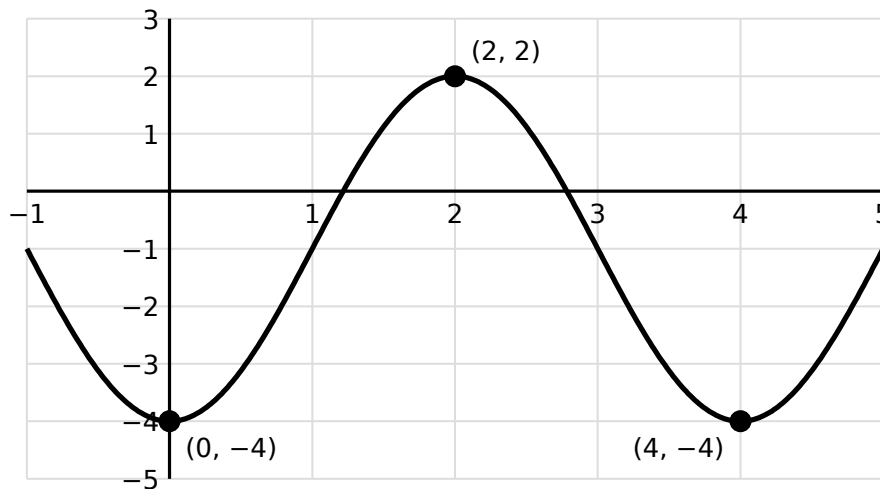
Time: 45 minutes · 8 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Features of a Sinusoid (2 points)

For $y = 5 \sin(4x - \pi) + 2$: (a) Find the amplitude and the period. (1 point) (b) Find the phase shift and the midline. (1 point)

Question 2 Equation from a Graph (2 points)

The graph shows a sinusoid with a maximum at $(2, 2)$ and minima at $(0, -4)$ and $(4, -4)$.



A sinusoidal graph.

- Find the amplitude, midline and period. (1 point)
- Write an equation of the form $y = A \sin(B(x - C)) + D$. (1 point)

Question 3 Tangent Features (2 points)

Let $y = \tan(3x)$. (a) Find the period. (1 point) (b) Find the two vertical asymptotes closest to the y -axis. (1 point)

Question 4 Write a Model from Extremes (3 points)

A sinusoidal function has a maximum of 14 at $x = 2$ and its next minimum of -6 at $x = 8$.

- Find the amplitude and the midline. (1 point)
- Find the period and B . (1 point)
- Write an equation using cosine. (1 point)

Question 5 Bobbing Buoy (3 points)

A buoy's height above the sea floor is $h(t) = 2.5 \sin(\pi t/3) + 4$ feet, t in seconds.

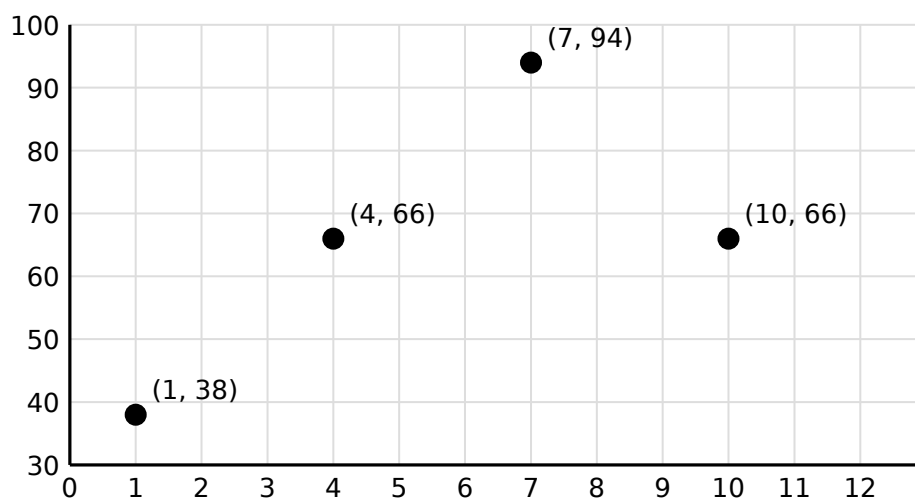
- Find the period. (1 point)
- Find the maximum and minimum heights. (1 point)
- Find the exact value of $h(1)$ and a decimal approximation. (1 point)

Question 6 Buoy at a Given Height (2 points)

For the buoy with $h(t) = 2.5 \sin(\pi t/3) + 4$, find every time in the first cycle ($0 \leq t < 6$) when the height is 5.25 feet.

Question 7 Monthly Temperatures (3 points)

The average high temperature in a city is 38°F in January (month 1) and 94°F in July (month 7), and the pattern repeats every 12 months. Points for months 1, 4, 7 and 10 are plotted.



Average highs for four months.

- a. Write a cosine model $T(m) = A\cos(B(m - C)) + D$. (2 points)
- b. Predict the average high in March (month 3). (1 point)

Question 8 Transformation Description (3 points)

The graph of $y = \cos x$ is transformed into $y = -2\cos(x/2) + 3$.

- a. Describe each transformation in order. (1 point)
- b. State the period. (1 point)
- c. State the range. (1 point)