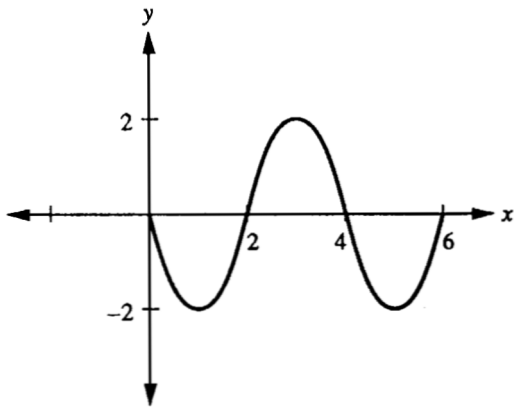
Unit Circle Day 7

Name: _____ **Date:** _____

1.



Write two functions whose graph is given. One must be a sine function and the other a cosine function.

2. What is the amplitude of the function $y = \pi \sin 4x - 3$?

A. $\frac{\pi}{2}$ B. π C. 4 D. 4π

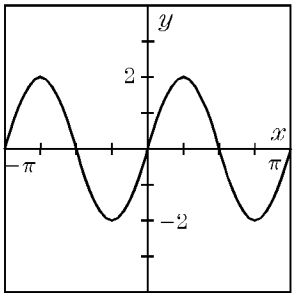
3. Which of the following equations describes the graph?

A. $y = 2 \sin \frac{\theta}{2}$

B. $y = \frac{1}{2} \sin \theta$

C. $y = \sin \theta$

D. $y = 2 \sin 2\theta$



4. About ten years ago, the Department of Natural Resources came up with this equation to model the fish population in a lake:

$$F = 337 - 61 \cdot \cos\left(\tfrac{\pi}{6}t\right)$$

In the equation, t is the number of months since January 2000 and F is thousands of fish.

a) Describe how the fish population changes over time. Include maximum and minimum values of the population and when they occur, the periodic nature of the population and a graph of the model.

b) In 2003, the Department of Natural Resources started collecting data on the fish population. The data is shown here:

Year	2003	2004	2005	2006	2007	2008	2009
Fish Population (in January)	276	276	271	266	261	256	251

Notice that the population started decreasing over time. What model best describes the fish population beginning with $t = 0$ for January 2004?

c) Using the new model, project the maximum and minimum populations of fish in the year 2020.

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5. The rotation of a Ferris wheel is modelled by the equation

$$h = 26\cos 2\pi\frac{(t-25)}{50} + 27$$

where h is the height above ground. Suppose you get on at $t = 0$ at the bottom. How high will you be after 35 s?

A. 35.03 m B. 27.00 m

C. 53.00 m D. 51.73 m

6. The rotation of a Ferris wheel is modelled by the equation

$$h = 28\cos 2\pi\frac{(t-20)}{40} + 29$$

where h is the height above ground. Suppose you get on at $t = 0$ at the bottom. How high will you be after 12 s?

A. 12.34 m B. 18.21 m

C. 37.65 m D. 48.56 m

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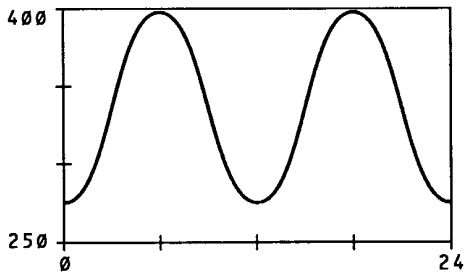
1.
Answer: Answers will vary. Example: $y = -2\sin\frac{\pi}{2}x$ or $y = 2\cos\left(\frac{\pi}{2}x + \frac{\pi}{2}\right)$.
Objective: F.TF.5

2.
Answer: B
Objective: F.TF.5

3.
Answer: D
Objective: F.TF.5

4.
Answer: The values of the fish population will repeat every year because the period of the function is 12. The minimum population of 276 fish occurs in January of each year. The maximum population of 398 fish occurs in July of each year. The graph of the function is shown with a viewing window of $0 \le x \le 24$ and $250 \le y \le 400$.



Answers will vary. Example $y = 337 - [61 \cdot \cos(\frac{\pi}{6}t) + \frac{5t}{12}]$. For this model, it is assumed that the first fish population decreases by 5 each year after 2004. (c) Answers will vary based on the model in the previous part. For the given example, the maximum population in the year 2020 is 318, and the minimum is 196.
Objective: F.TF.5

5.
Answer: A
Objective: F.TF.5

6.
Answer: C
Objective: F.TF.5