Topic 3.6: Sinusoidal Function Transformations
Topic 3.7: Sinusoidal Function Context and Data Modeling

Using real world data to find patterns and create sinusoidal functions

Practice Problem 1

While watching the tides come in and out on Fripp Island, SC, Alan noticed a pattern. The patterned of the heights of the tides resembled a sinusoidal function of the form $g(x) = a\cos\big(b(x+c)\big) + d$ where $a, b, c,$ and d are constants. He searched for data and found that the maximum height of the tide on Jan 1, 2025 was 6.776 feet and the minimum height was 0.152 feet. If the values of $b, c,$ and d have already been determined, which would best define $g(x)$?

(a) $3.464\ \cos\big(b(x+c)\big) + d$

(b) $6.624\cos\big(b(x+c)\big) + d$

(c) $6.928\cos\big(b(x+c)\big) + d$

(d) $3.312\cos\big(b(x+c)\big) + d$

Practice Problem 2

There is a circular racetrack in Italy called the Nardo Ring. The Ring is 12.5 km long, which means that a car in a race is at its farthest point from the start/finish line approximately 3.979 km away. As a car travels around the circular track, its distance from the start/finish line represents a sinusoidal patter in the form $h(x) = a\sin(bx) + d$. Traveling at 290 km per hour, it would take a car approximately 2.586 minutes to complete one lap. Which of the following could represent $h(x)$?

(a) $h(x) = -3.979\cos(4.062\,x) + 1.9895$

(b) $h(x) = -1.990\ \cos(4.062\,x) + 1.9895$

(c) $h(x) = 3.979\cos(4.062\,x) + 1.9895$

(d) $h(x) = 1.990\cos(4.062\,x) + 1.9895$

Practice Problem 1 Solution:

(d) $3.312\cos\big(b(x+c)\big)+d$

The correct value of *a* (amplitude) is half the difference between the minimum and maximum tide height values.

$\frac{6.776-0.152}{2}=3.312$

Practice Problem 2 Solution:

(b) $h(x)=\ -1.990\ \cos(4.062\ x)+1.9895$

Since the *b* and *d* values are the same for each choice, the student needs to select the correct *a* value. To find this you need to find half the difference between the minimum and maximum differences from the start/finish line $\left(\frac{3.979-0}{2}=1.9895\right)$. Since the start/finish line is at a distance of 0 km, the car would be starting at a minimum, resulting in a negative *a* value.