KILROY ACADEMY

WHAT ARE TIDES?

ANSWER KEY

Video:

1. How the sea level rises and falls daily
2. Measure the tides
   Learn trigonometry related to right triangles and the unit circle
3. Unit circle
4. x , y
5. Sinusoidal

Reviewing Right Triangle Trigonometry:

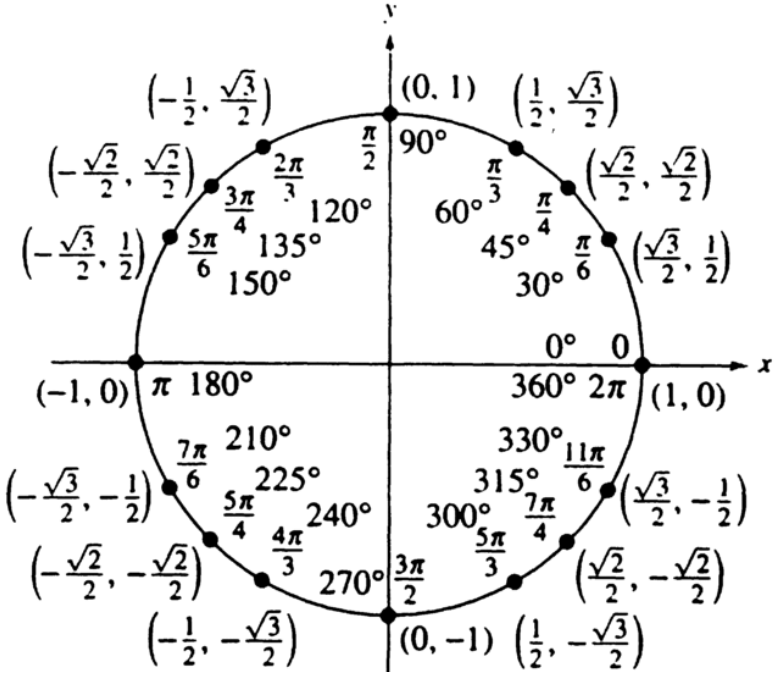
*Remember that 1/√2 X √2/√2 = √2/2

$45 - 45 - 90$ $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

$30 - 60 - 90$ $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

Switch the values for sine and cosine.

Unit Circle:



Reflections on the patterns in the coordinates of the unit circle:

- At $45°$ cosine and sine are both = $\frac{\sqrt{2}}{2}$
- At $30°$ cosine = $\frac{\sqrt{3}}{2}$ and sine = $\frac{1}{2}$
- At $60°$ cosine = $\frac{1}{2}$ and sine = $\frac{\sqrt{3}}{2}$
- The values of cosine and sine switch places at $30°$ and $60°$
- It is easy to see that the radius of the unit circle is 1 when looking at the x and y axis. $0° = (1,0);\ 90° = (0,1); 180° = (-1,0); 270° = (0,-1); 360° = (1,0)$
- $cos^2 + sin^2 = 1$
- The pattern stays consistent as you rotate around the unit circle. The signs change depending upon what quadrant you are in.

Radian Measure:
Convert from Degrees to Radians.

1. $\frac{\pi}{6}$
2. $\frac{2\pi}{3}$
3. $\frac{3\pi}{2}$
4. $\frac{\pi}{3}$
5. $\frac{\pi}{4}$
6. $\frac{7\pi}{4}$
7. π
8. $\frac{5\pi}{4}$

Convert from Radians to Degrees.

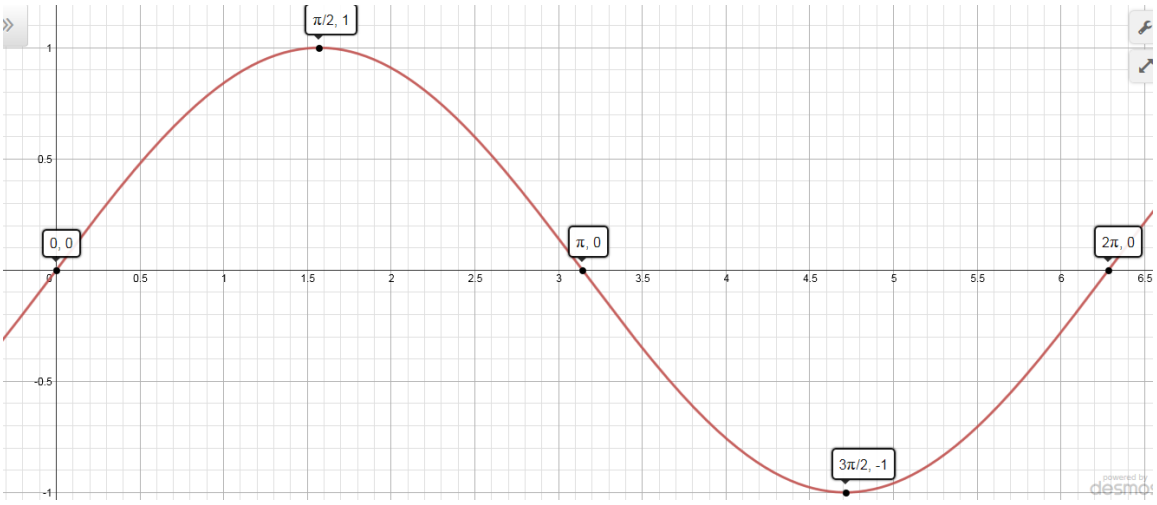
9. $60°$
10. $270°$
11. $180°$
12. $225°$
13. $120°$
14. $210°$
15. $90°$
16. $330°$

Graphing the Sine Wave

Quadrantles in radian measure: $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$

Observations regarding the coordinate points of these angles:

- All have a distance of 1 from the origin which means the radius of the unit circle is 1.
- All are intercepts on the axes.
- $\cos(0) = 1$
- $\sin(0) = 0$
- $\cos\left(\frac{\pi}{2}\right) = 0$
- $\sin\left(\frac{\pi}{2}\right) = 1$
- $\cos(\pi) = -1$
- $\sin(\pi) = 0$
- $\cos\left(\frac{3\pi}{2}\right) = 0$
- $\sin\left(\frac{3\pi}{2}\right) = -1$
- $\cos(2\pi) = 1$
- $\sin(2\pi) = 0$

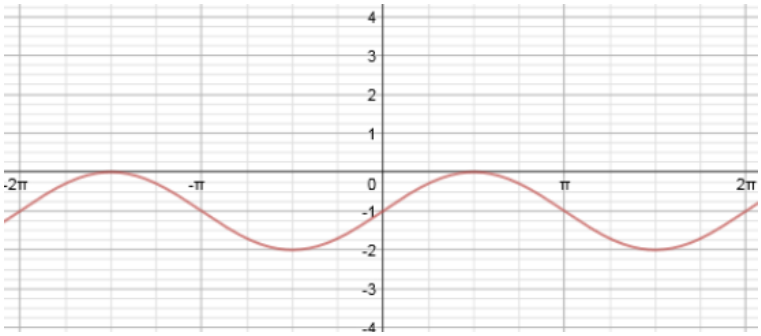


Key Features of the Sine Function:

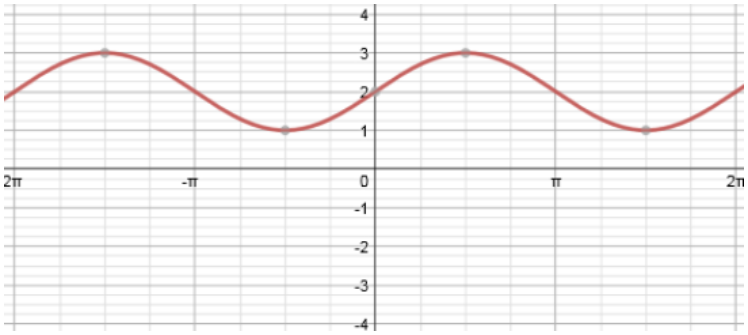
1. $a = 1;\ b = 1;\ c = 0;\ d = 0$
2. x-axis
3. 2π
4. All of the y-values for the function's ordered pairs would be opposite, causing a direct reflection on the x-axis.

Graphing Sinusoidal Functions:

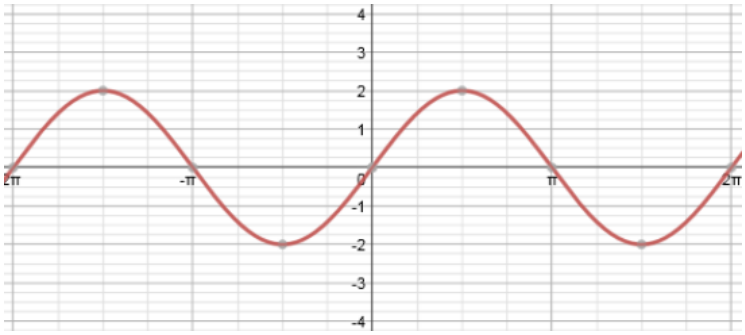
1. Amplitude: 1 Period: 2π Phase Shift: 0 Vertical Shift: -1



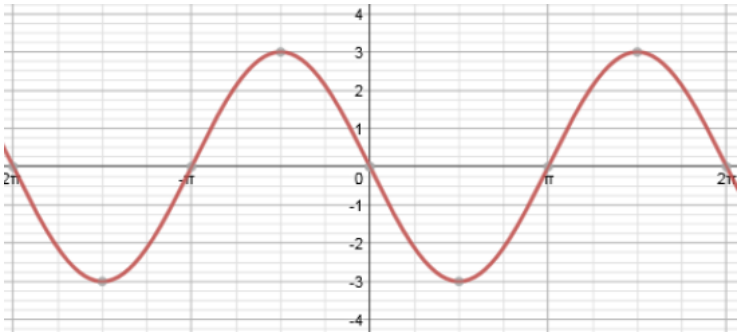
2. Amplitude: 1 Period: 2π Phase Shift: 0 Vertical Shift: 2



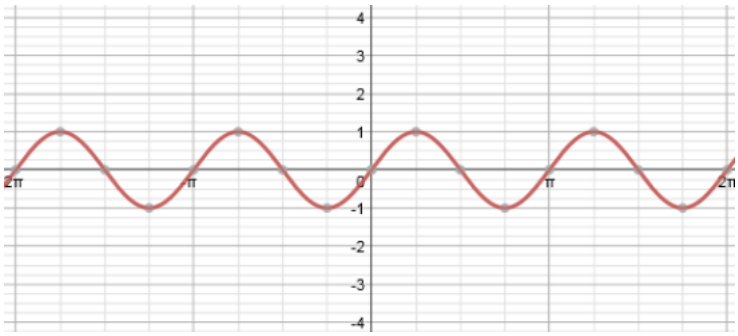
3. Amplitude: 2 Period: 2π Phase Shift: 0 Vertical Shift: 0



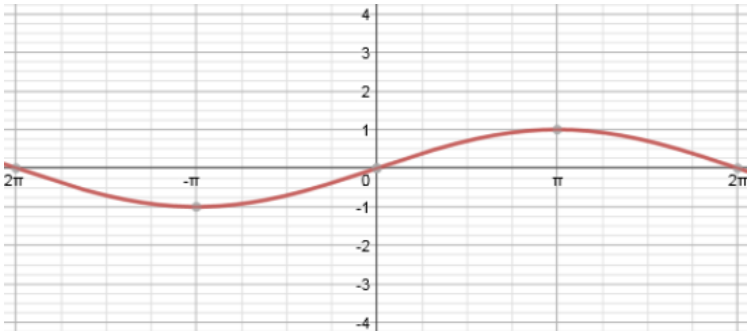
4. Amplitude: 3 Period: 2π Phase Shift: 0 Vertical Shift: 0



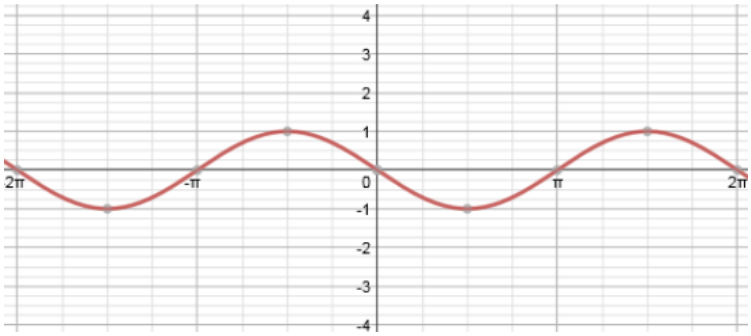
5. Amplitude: 1 Period: π Phase Shift: 0 Vertical Shift: 0



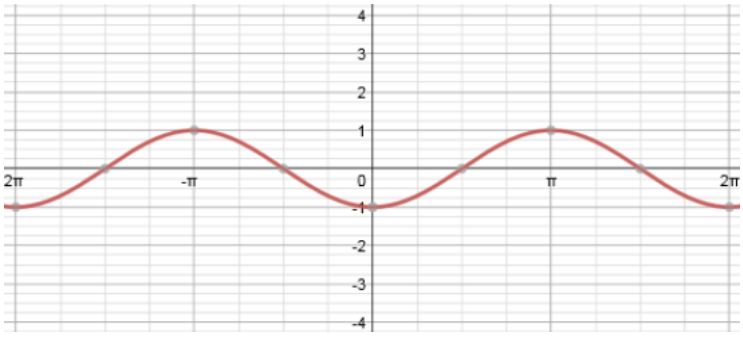
6. Amplitude: 1 Period: 4π Phase Shift: 0 Vertical Shift: 0



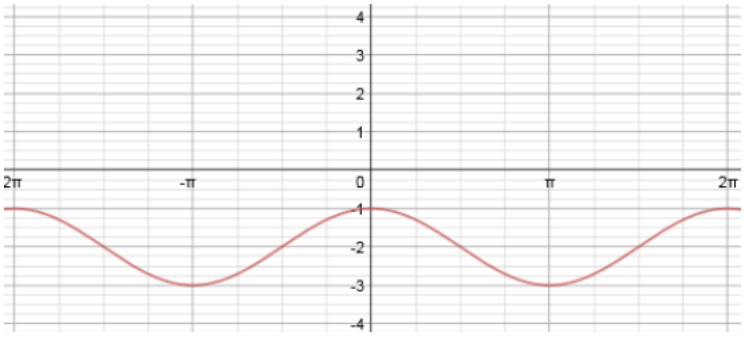
7. Amplitude: 1 Period: 2π Phase Shift: $-\pi$ Vertical Shift: 0



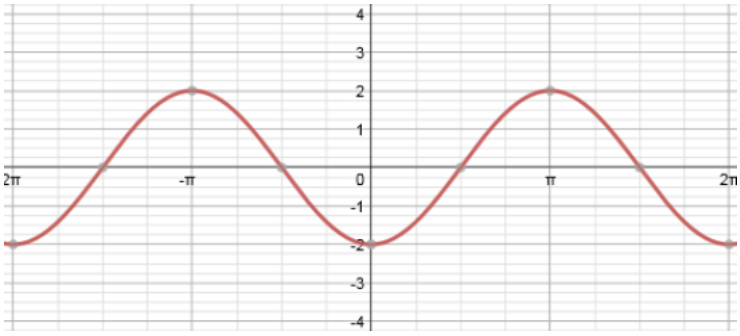
8. Amplitude: 1 Period: 2π Phase Shift: $\frac{\pi}{2}$ Vertical Shift: 0



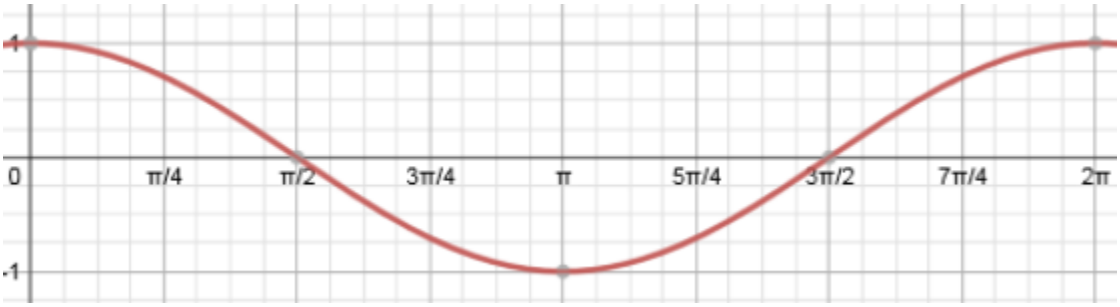
9. Amplitude: 1 Period: 2π Phase Shift: $-\frac{\pi}{2}$ Vertical Shift: -2



10. Amplitude: 2 Period: 2π Phase Shift: $\frac{\pi}{2}$ Vertical Shift: 0

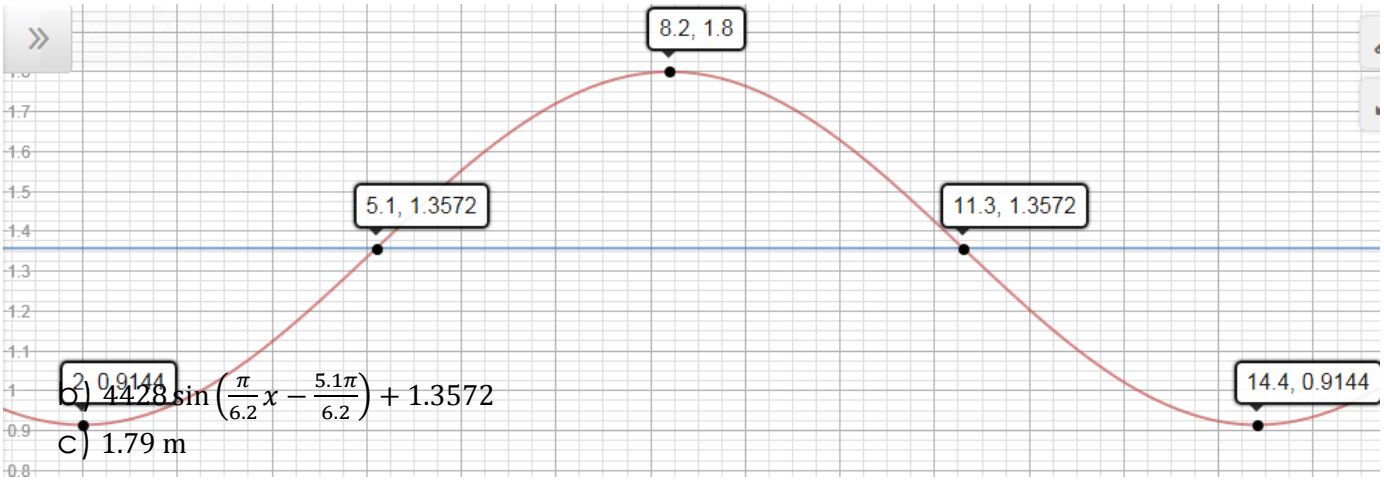


Extension to Cosine:



Application of Sine to Tides:

1. a)

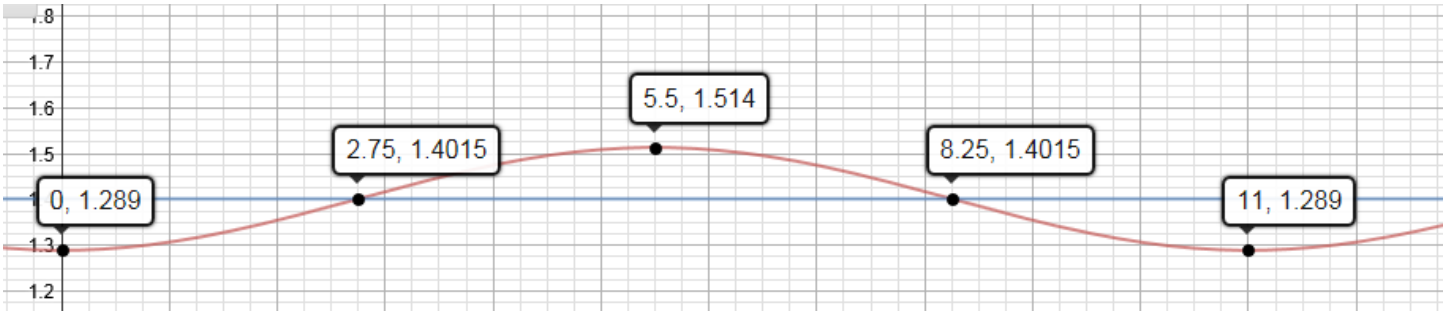


b) $4428\sin\left(\frac{\pi}{6.2}x-\frac{5.1\pi}{6.2}\right)+1.3572$

c) 1.79 m

Sample Answer to #2 and #3. Student answers will vary based on selection of Kilroy™ monitor, dates and times.

Kilroy™ Location: Vero Beach KFL0018		
Date	**Time**	**Water Depth**
1/10/2015	9:03 am	1.289 m
1/10/2015	2:30 pm	1.514 m



$$y = 0.1125 \sin\left(\frac{2\pi}{11}x - \frac{\pi}{2}\right) + 1.4015$$

ACKNOWLEDGEMENTS

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