Transformations of Sine and Cosine

Goal: • Can graph $a \cdot \sin\big(b(x-c)\big) + d$ based on transformations (or cosine). • Can build the equation of a sinusoidal function based on its graph or characteristics.
Terminology: • Phase Shift • Vertical Displacement

We are going to graph functions of the form $a \sin\big(b(x-c)\big) + d$ just as we did with transformations.

Definition: The **phase shift** is the value of

Characteristics effected are:

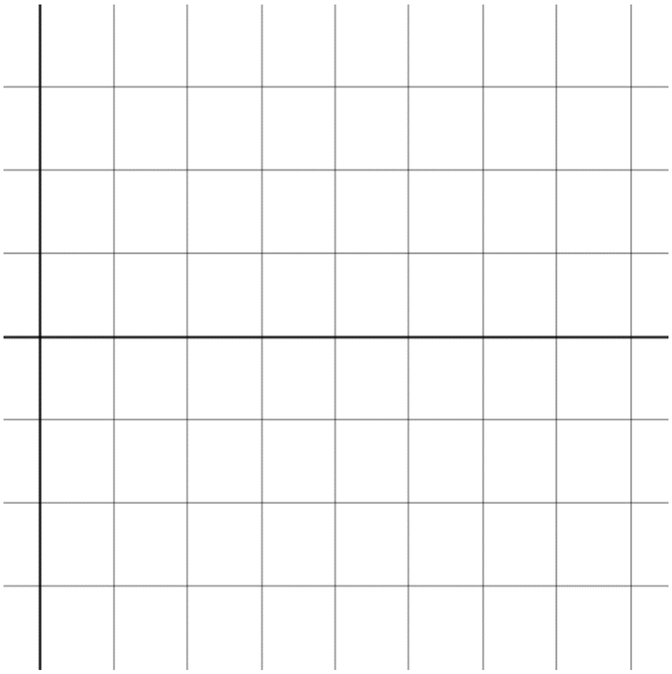
**Note that when we talk about phase shift, the transformed function is in standard form with b factored out

Definition: The **vertical displacement** is the value of

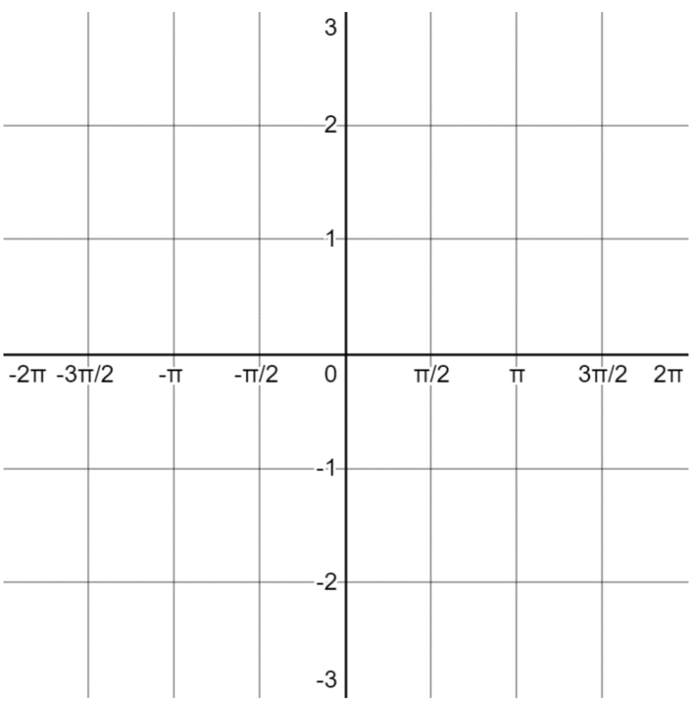
Characteristics effected are:

Example: Graph $f(\theta) = 2\sin\left(\theta - \frac{\pi}{4}\right) + 1$

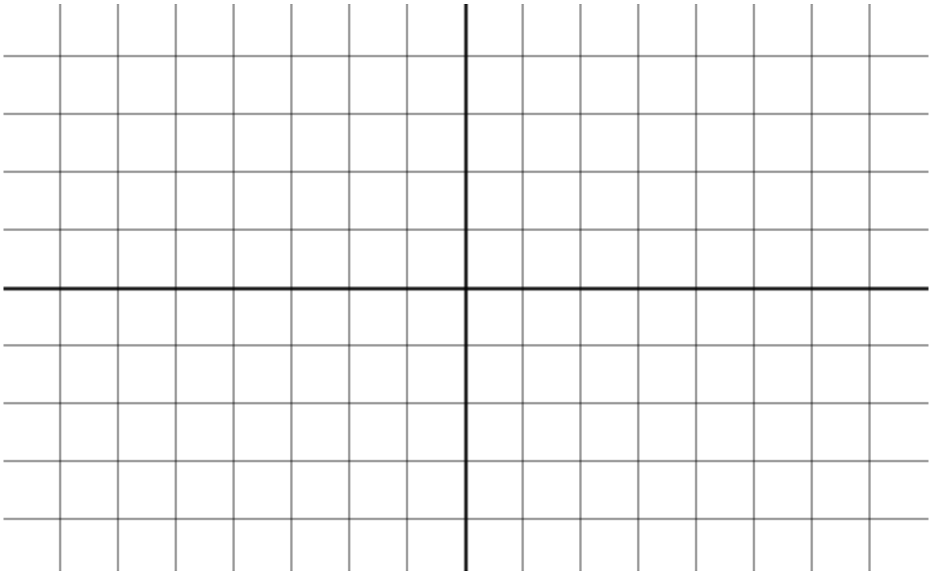
- Identify the midline from the vertical displacement
- Use the amplitude to find the max and min lines
- Use the phase shift to identify the starting point
- Split the period into quarters.



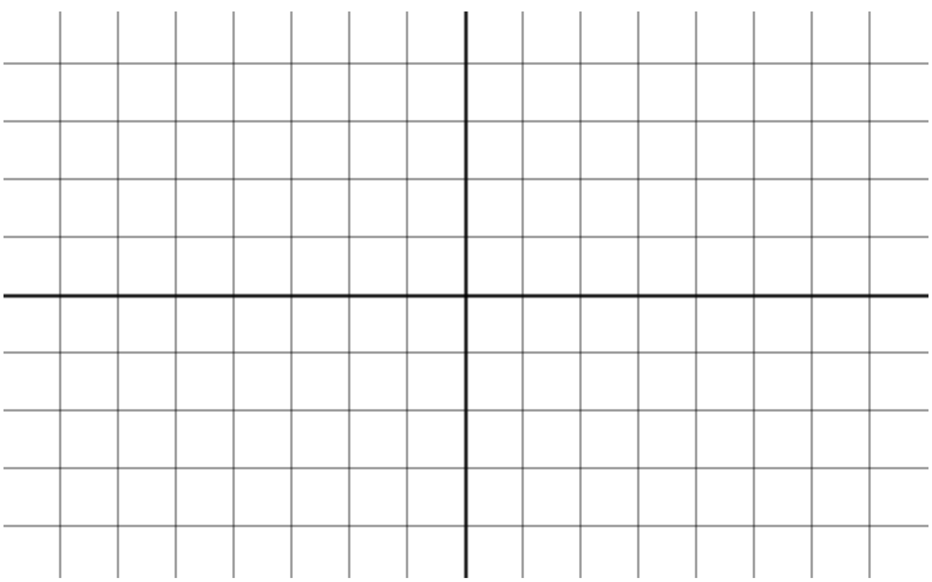
Practice: Graph $g(\theta) = -\sin\left(\theta + \frac{\pi}{2}\right) - 1$



Practice: Graph $h(\theta) = 0.5\cos\left(\frac{\pi}{3}(\theta + 1)\right) - 1.5$



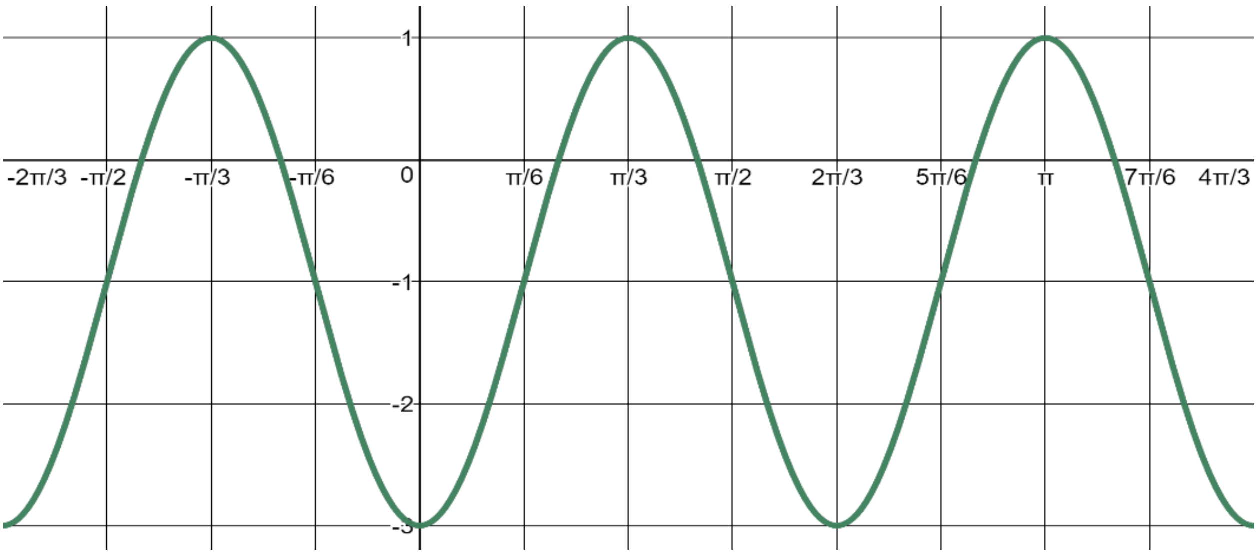
Practice: Graph $k(\theta) = 3\sin\left(\frac{1}{2}\left(\theta - \frac{\pi}{2}\right)\right) - 1$



When trying to determine the equation of a sinusoidal function, do the same steps

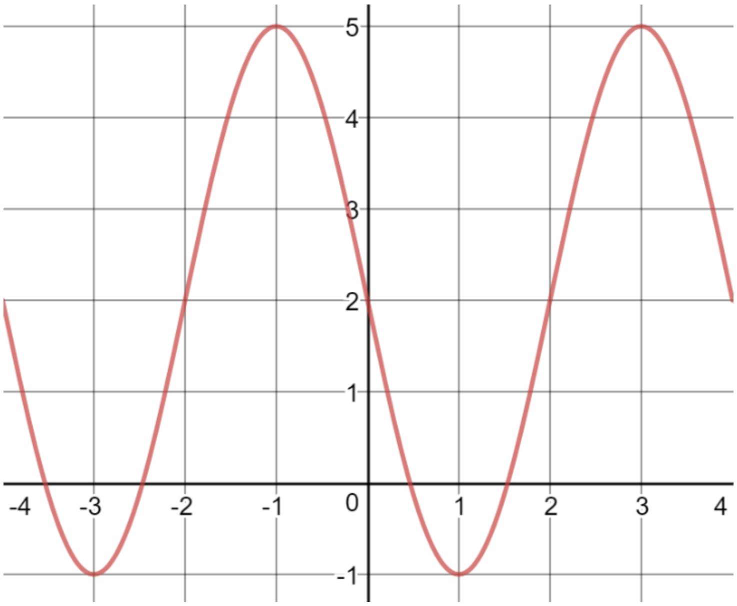
- Identify the midline
- Use the midline to determine the amplitude
- Use the distance between peaks to find the period
- Decide if you want a cosine or sine equation. Pick the place to start and identify the phase shift.

Example: Determine 3 different equations that could describe the following function.



Example: Determine two equations (one sine, one cosine) that could describe a sinusoidal function that has two minimums at $(-1,-3)$ and $(3,-3)$ and has an amplitude of 0.5.

Practice: Determine 3 different equations that could describe the following function



Practice: Determine two equations (one sine, one cosine) that could describe a sinusoidal function that has a maximum at $\left(\frac{3\pi}{2}, 3\right)$ and the nearest minimum is at $\left(\frac{9\pi}{2}, -1\right)$.

Suggested Practice Problems: 5.2 # 1-2 (radians), 4-9, 12-16, 18, 20, 22-24, 27, 28	
Textbook Reading: Reading: Textbook page 238-248 Key Ideas page 249	
Next Class: Modelling Trig Equations	