

Finding the Equation of a Trigonometric Function from its Graph

Steps for determining the equation of a sinusoidal function from its graph

1. Find the maximum and minimum values
2. Use the formula $a = \frac{\max - \min}{2}$ and $c = \frac{\max + \min}{2}$ to determine the amplitude and the vertical displacement (which is also the equation of the axis of the curve). On the graph, draw a **dashed line** to represent the equation of the axis.
3. Highlight one complete cycle that is closest to the y-axis.
 - To write your equation in terms of **cosine**: Use two consecutive maximum values of the function as the starting point and end point for your cycle
 - To write your equation in terms of **sine**: Use two values on the axis of the curve of the function as a starting point and end point for your cycle
4. Using your highlighted cycle, find the period of your function and use the period to find the k value
 - $\text{New period} = \frac{\text{Original period}}{|k|}$ so $|k| = \frac{2\pi}{p}$ for $\sin(x)$ and $\cos(x)$, and $|k| = \frac{\pi}{k}$ for $\tan(x)$
5. Find the phase shift of your function by determining the horizontal distance of the beginning of your highlighted cycle from the y-axis.
6. Incorporate all of the transformations into the equation $y = a\sin[k(x - d)] + c$ or $y = a\cos[k(x - d)] + c$
7. To convert from sine to cosine: phase shift by $-\frac{\pi}{2k}$ in the (x-d) bracket (i.e. ~~subtract~~ ^{add} a quarter of the period from x).
- To convert from cosine to sine phase shift by $+\frac{\pi}{2k}$ in the (x-d) bracket (i.e. ~~add~~ ^{subtract} a quarter of the period to x).