Phase Shift; Sinusoidal curve Fitting

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Graph Sinusoidal Functions of the Form $y = Asin(\omega x - \phi) + B$:

Graph of $y = Asin(\omega x - \phi) = Asin[\omega(x - \frac{\phi}{\omega})]$ is same as the graph of $y = sin(\omega x)$, except that it has been shifted $\frac{|\phi|}{\omega}$ units (to right if $\phi > 0$ and to the left if $\phi < 0$). $\frac{\phi}{\omega}$ is called the phase shift of the graph of $y = Asin(\omega x - \phi)$.

Definition:
For the graphs of $y = Asin(\omega x - \phi)$ or $y = Acos(\omega x - \phi)$, $\omega > 0$,

- Amplitude = $|A|$, Period = $T = \frac{2\pi}{\omega}$, Phase shift = $\frac{\phi}{\omega}$

The phase shift is to the left if $\phi < 0$ and to the right if $\phi > 0$

Steps for Graphing Sinusoidal functions $y = Asin(\omega x - \phi) + B$ or $y = Acos(\omega x - \phi) + B$:

1. Determine the amplitude $|A|$, Period $T = \frac{2\pi}{\omega}$, and phase shift $\frac{\phi}{\omega}$
2. Determine the starting point of one cycle of graph, $\frac{\phi}{\omega}$. Determine the end points of one cycle of the graph, $\frac{\phi}{\omega} + \frac{2\pi}{\omega}$ into four subintervals, each of length $\frac{2\pi}{\omega} \div 4$.
3. Use the endpoints of the subintervals to find the five key points on the graph.
4. Plot the five key points and connect them with a sinusoidal graph to obtain one cycle of the graph. Extend the graph in each direction to make it complete.
5. If $B \neq 0$, apply a vertical shift.