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# Sine Function

Name

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Respond to the following questions.

Consider the function $f(x)=3\sin(2x)-1$.

- What is the **amplitude** of this function?
- What is the **period** of this function?
- What is the **vertical shift** of this function?
- What is the maximum value of $f(x)$?

A sine function has an amplitude of 4, a period of $\pi$, and a phase shift of $\pi/4$ to the right. There is no vertical shift.
Write the equation of this sine function in the form $y=A\sin(B(x-C))+D$.
What is the value of B?

Describe how the graph of $g(x)=\sin(x+\pi/2)$ compares to the graph of $y=\sin(x)$.
What is the phase shift?
Does it shift to the left or right?

For the function $h(x)=1/2\sin(x)$:
What is its amplitude?
How does its graph compare to the graph of $y=\sin(x)$ in terms of vertical stretch or compression?

Evaluate the following:
$\sin(0)$
$\sin(\pi/2)$
$\sin(\pi)$
$\sin(3\pi/2)$

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## Answer Key

Respond to the following questions.

**Amplitude:** The amplitude is $|A|$, so it is 3.
**Period:** The period is $2\pi/|B|$, so it is $2\pi/2=\pi$.
**Vertical Shift:** The vertical shift is D, so it is $-1$ (shifted down 1 unit).
**Maximum Value:** The maximum value is $D+\text{Amplitude}=-1+3=2$.

**Amplitude:** $A=4$.
**Period:** We know Period $=2\pi/|B|$. Since Period $=\pi$, then $\pi=2\pi/B \Longrightarrow B=2\pi/\pi=2$.
**Phase Shift:** $C=\pi/4$ (positive for right shift).
**Equation:** $y=4\sin(2(x-\pi/4))$
**Value of B:** 2

This is in the form $y=A\sin(B(x-C))+D$. Here $C=-\pi/2$.
Phase Shift: $\pi/2$.
Since C is negative, it indicates a shift to the left by $\pi/2$ units.

**Amplitude:** The amplitude is $|A|$, so it is $1/2$.
Comparison to $y=\sin(x)$: Since the amplitude is $1/2$ (which is less than 1), the graph is vertically compressed (or "shrunk") by a factor of $1/2$ compared to $y=\sin(x)$.

$$\sin(0) = 0$$
$$\sin\left(\frac{\pi}{2}\right) = 1$$
$$\sin(\pi) = 0$$
$$\sin\left(\frac{3\pi}{2}\right) = -1$$