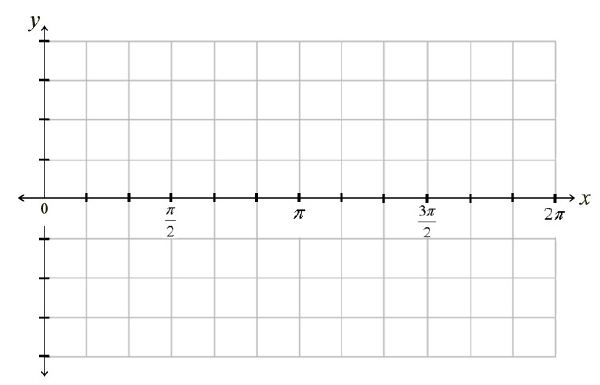
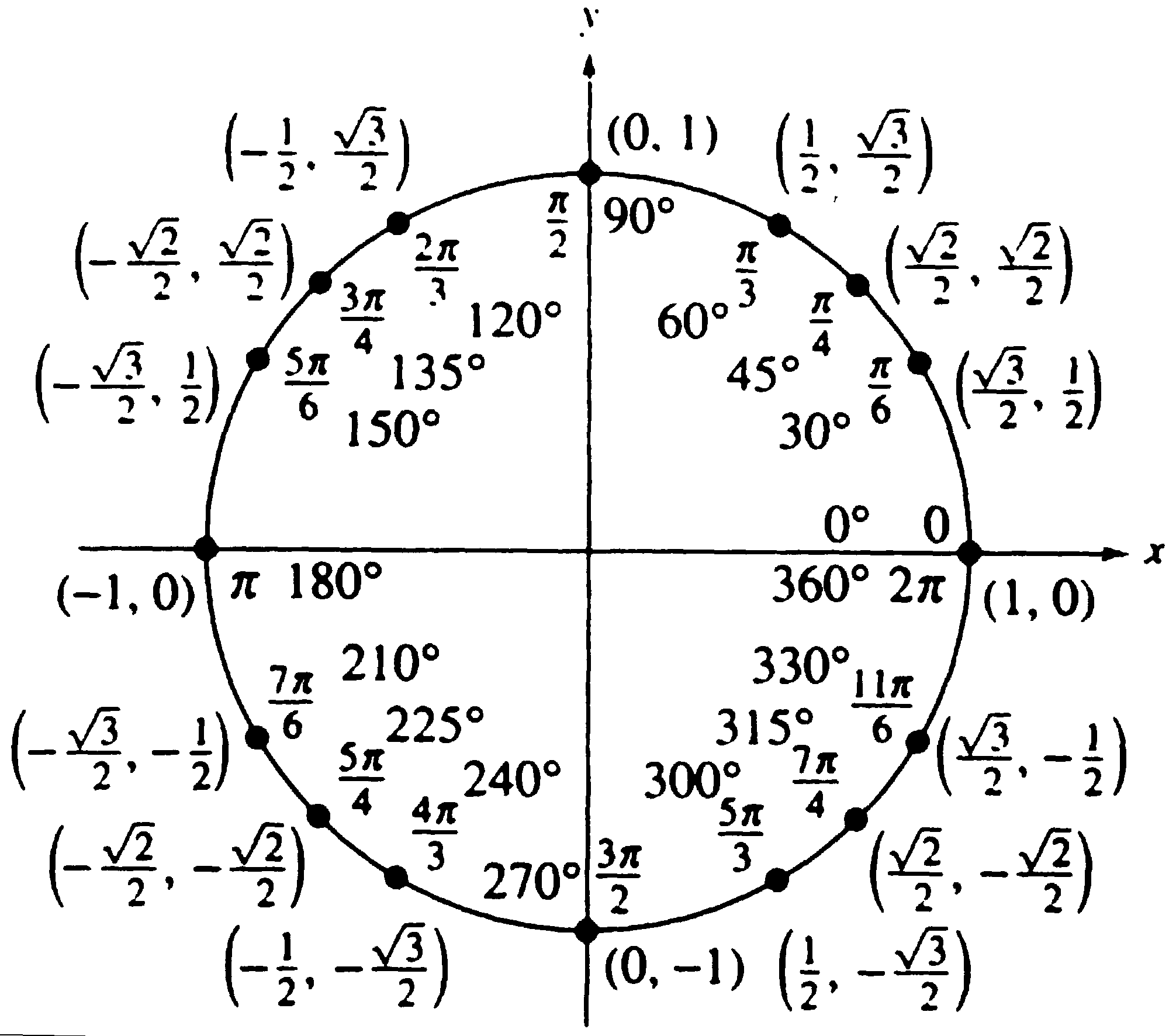
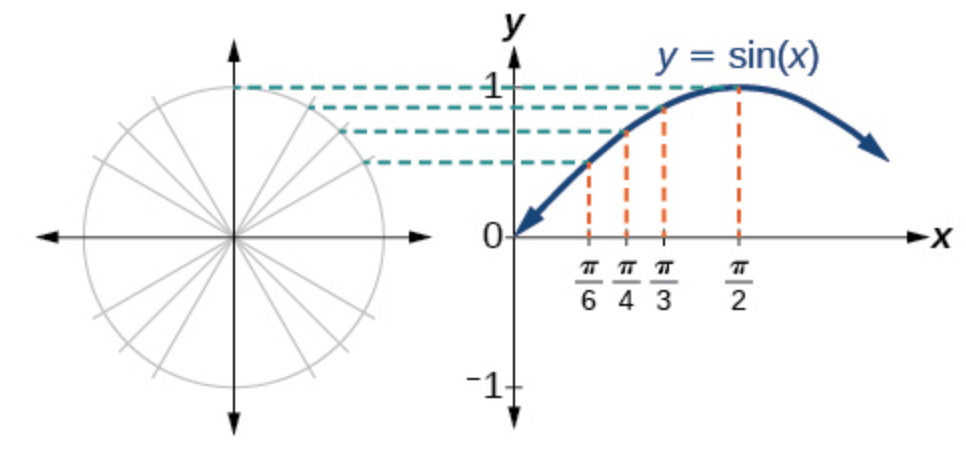
**8.1 – Graphs of Sine and Cosine Functions**

**The Graph of**



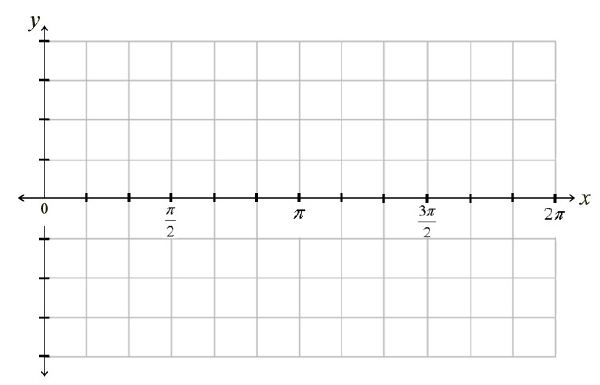
|  |  |
| --- | --- |
| *x* | *y* |
|  |  |
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|  |  |
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|  |  |
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|  |  |
|  |  |
|  |  |



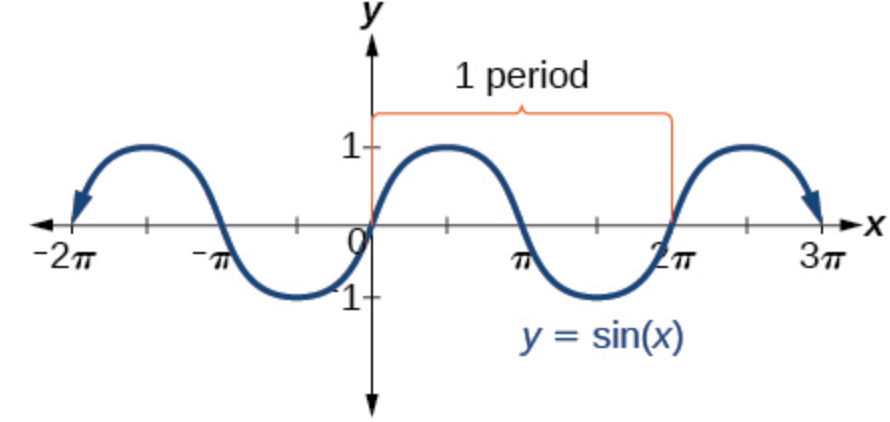
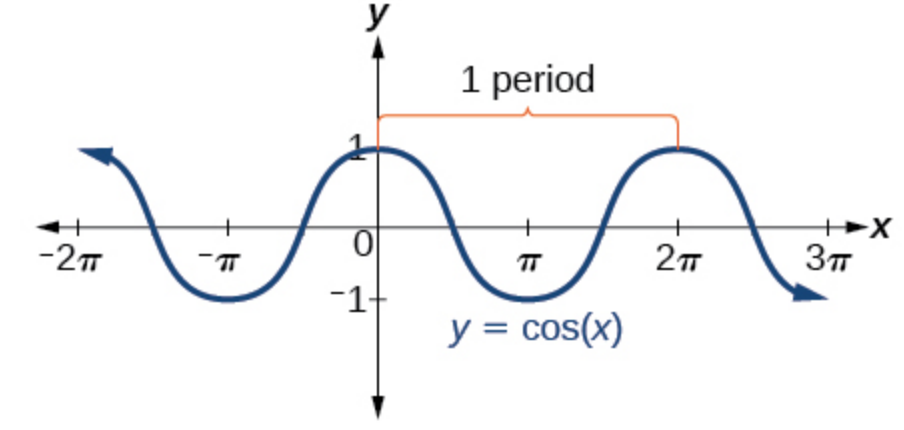


**The graph of**

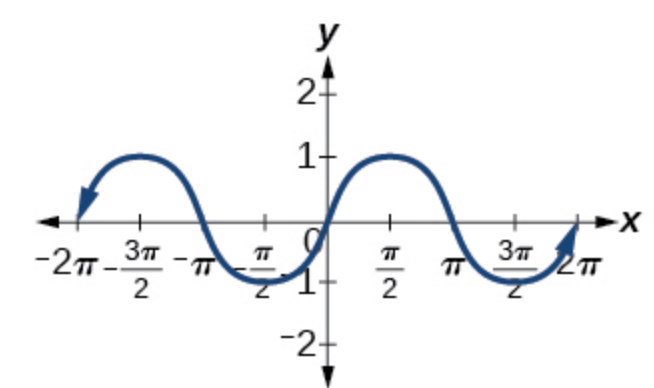
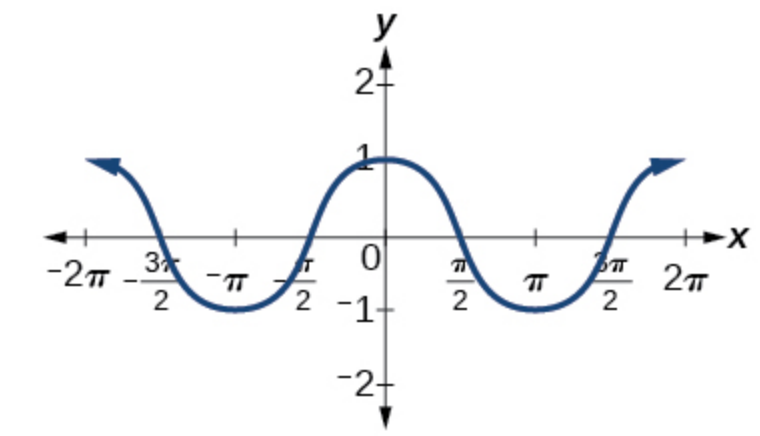
|  |  |
| --- | --- |
| *x* | *y* |
|  |  |
|  |  |
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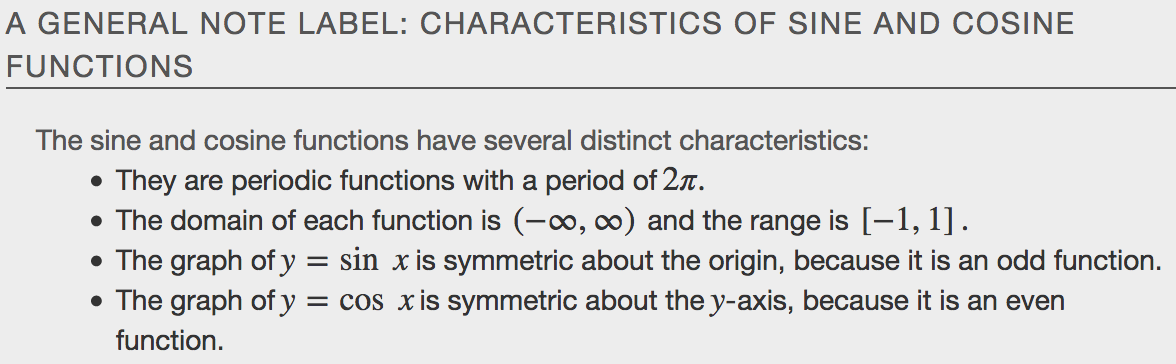
In both graphs, the shape of the graph repeats after 2*π*, which means the functions are periodic with a period of 2*π*. A periodic function is a function for which a specific horizontal shift, *P*, results in a function equal to the original function: *f*(*x*+*P*)=*f*(*x*)for all values of *x* in the domain of *f*. When this occurs, we call the smallest such horizontal shift with *P*>0 the period of the function.

**Even/Odd**

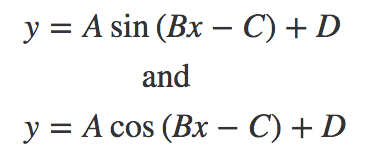
** **

** **

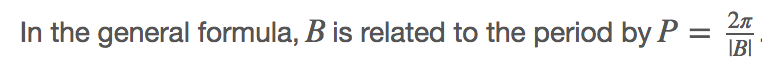
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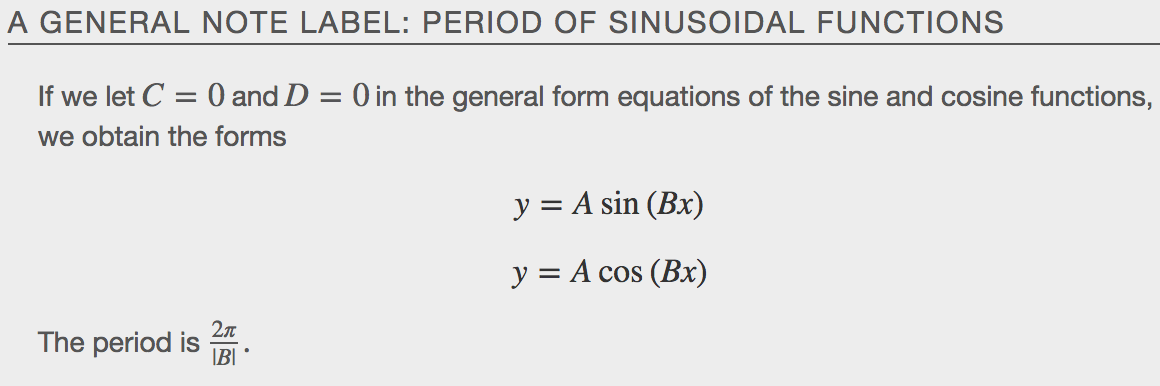
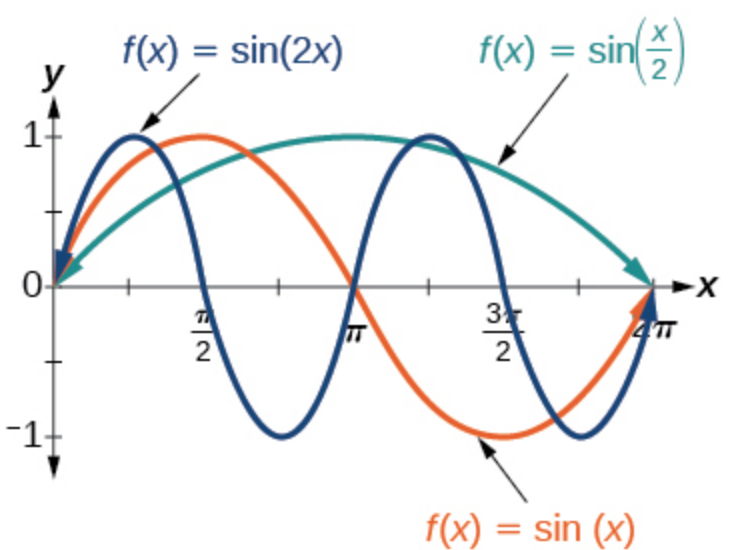
**Investigating Sinusoidal Functions**

A function that has the same general shape as a sine or cosine function is known as a sinusoidal function. The general forms of sinusoidal functions are

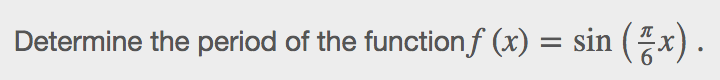
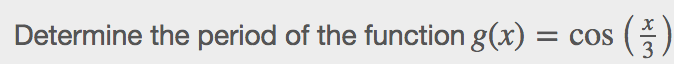
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**Determining the Period of Sinusoidal Functions**

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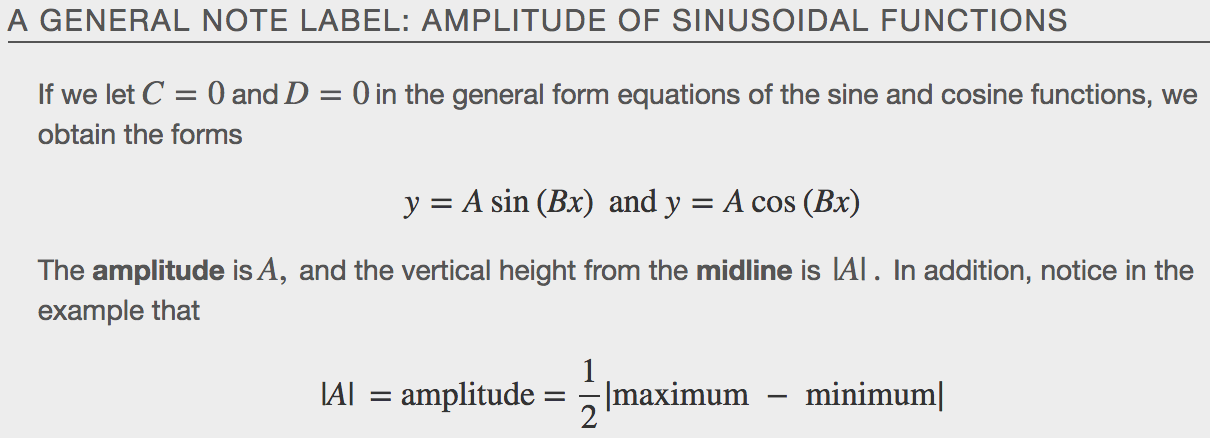
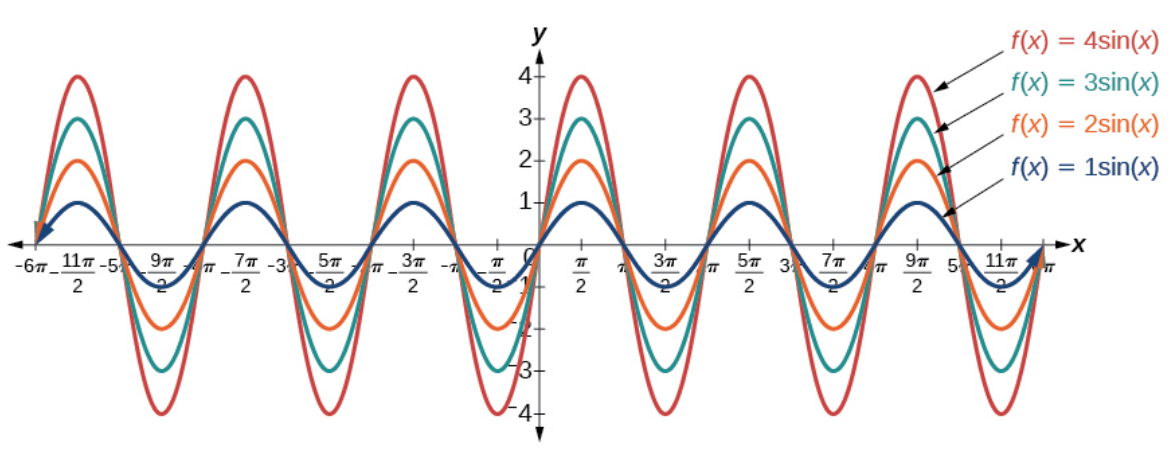
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**Examples**

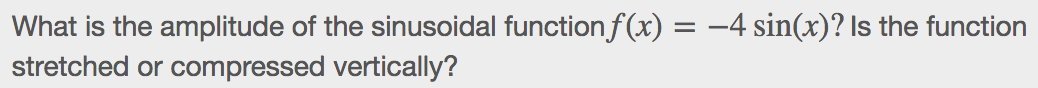
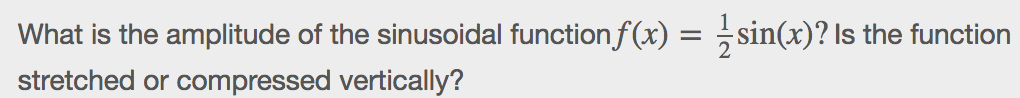
** **

**Determining Amplitude**

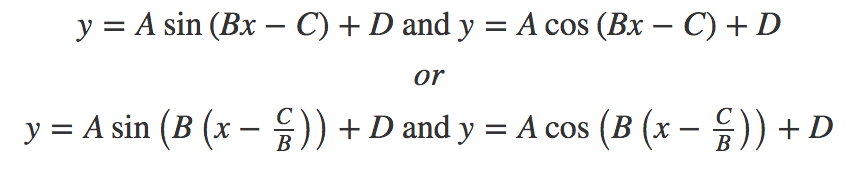
Now let’s turn to the variable *A,* so we can analyze how it is related to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or greatest distance from rest. *A* represents the vertical stretch factor, and its absolute value |*A*| is the amplitude. The local maxima will be a distance |*A*| above the vertical **midline** of the graph, which is the line *x*=*D*; because *D*=0 in this case, the midline is the *x*-axis. The local minima will be the same distance below the midline. If |*A*|>1,the function is stretched.



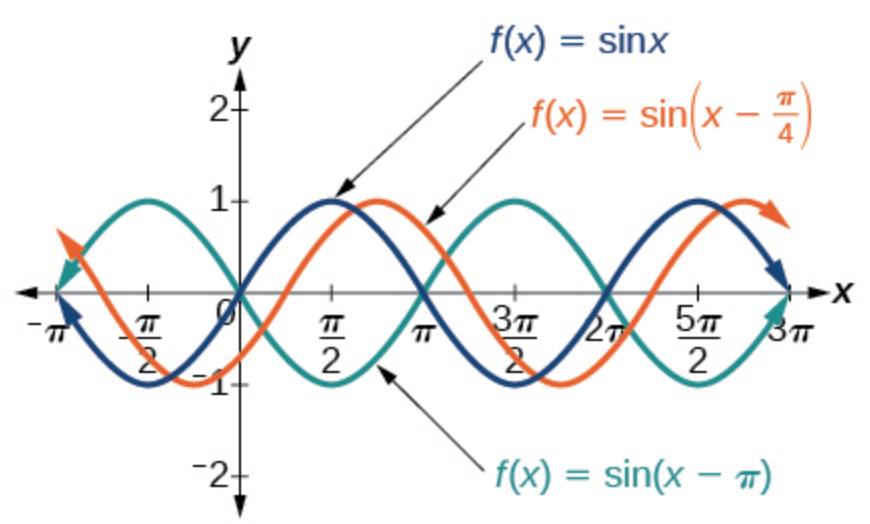
**Examples**

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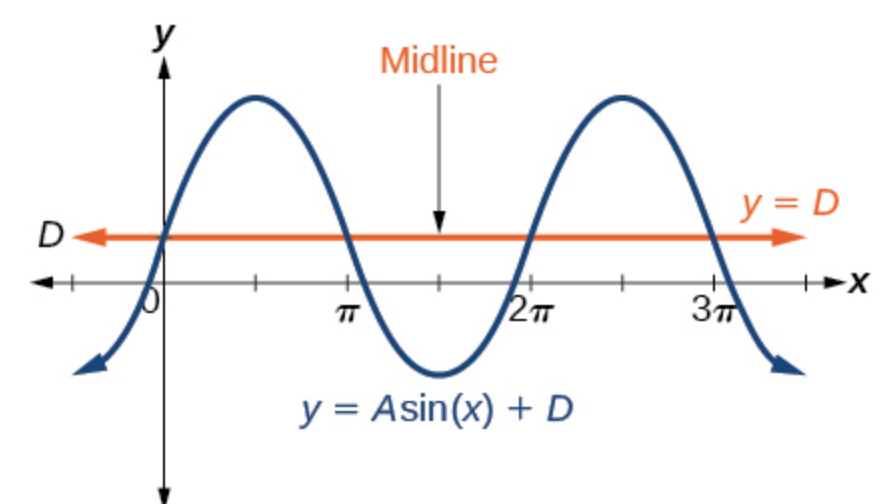
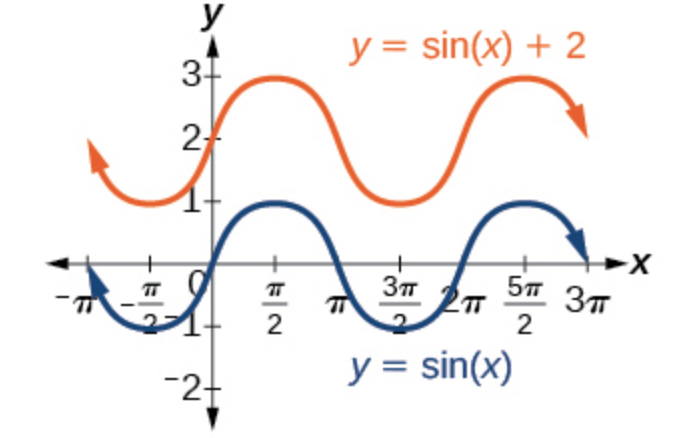
**Analyzing Graphs of Variations of  and **

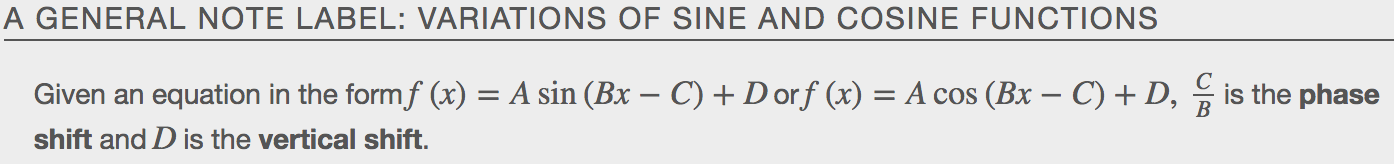
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The value for a sinusoidal function is called the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, or the horizontal displacement of the basic sine or cosine function. If *C*>0, the graph shifts to the \_\_\_\_\_\_\_\_\_\_. If *C*<0, the graph shifts to the \_\_\_\_\_\_\_\_\_. The greater the value of∣*C*∣,the more the graph is shifted. The figure below shows that the graph of *f*(*x*)=sin(*x*−*π*)shifts to the \_\_\_\_\_\_\_ by \_\_\_units, which is more than we see in the graph of *f*(*x*)=sin(*x* − ),which shifts to the right by \_\_\_\_\_units.



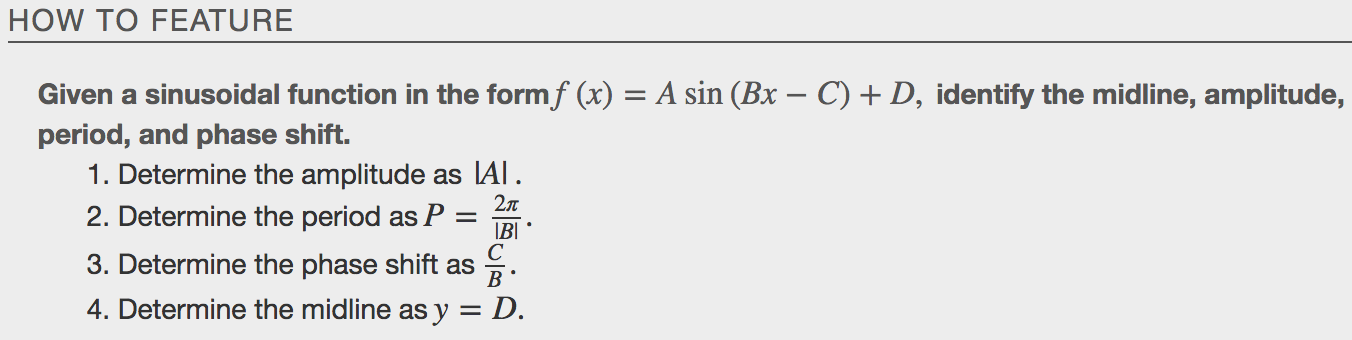
While *C* relates to the horizontal shift, *D* indicates the vertical shift from the midline in the general formula for a sinusoidal function. The function *y*=cos(*x*)+*D* has its midline at *y*=*D*.

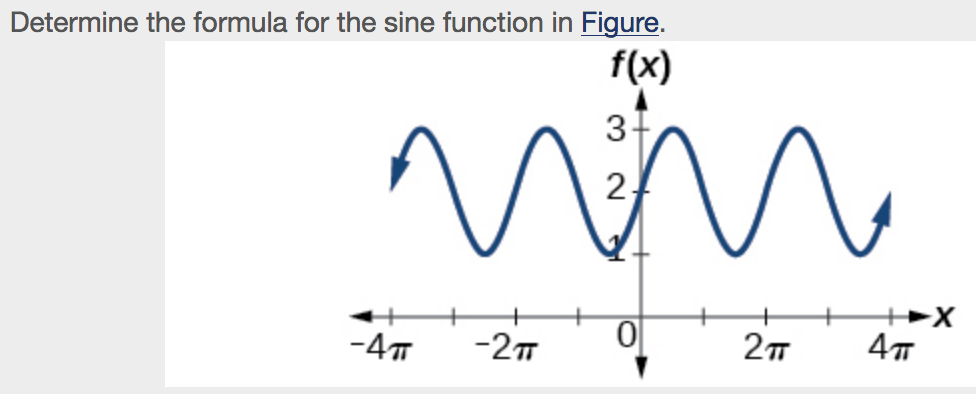


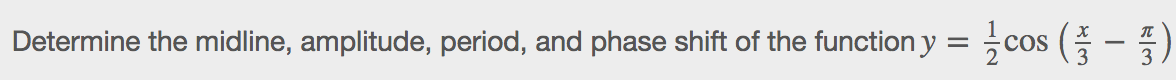
**Examples**

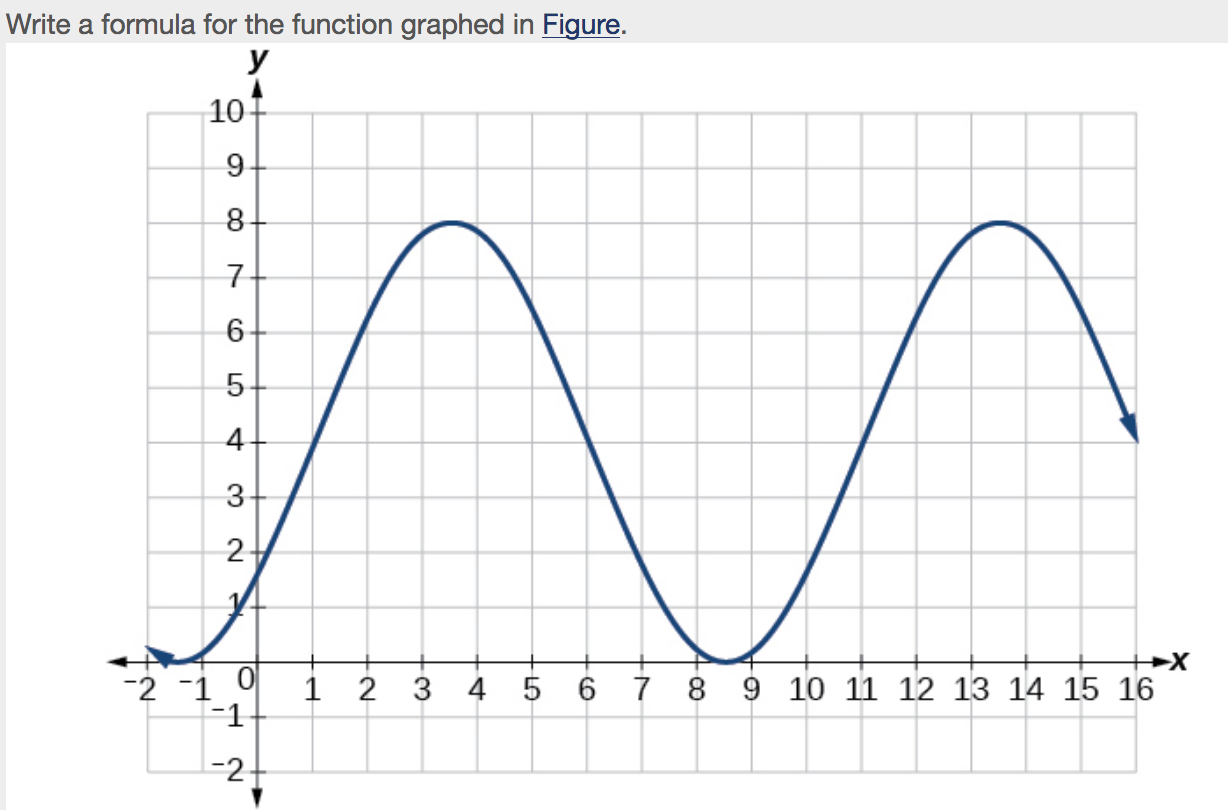
** **

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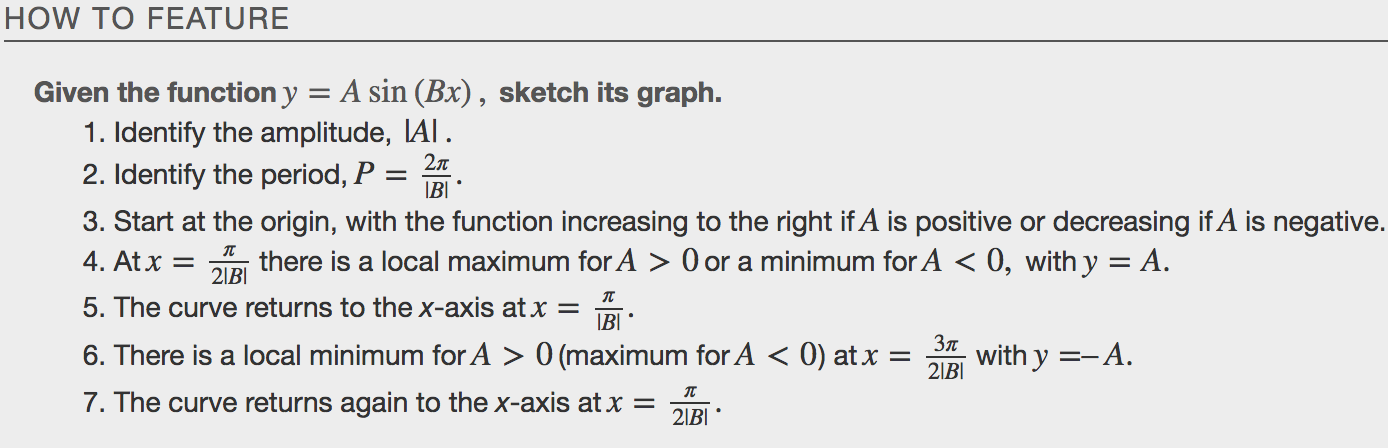
**Examples**

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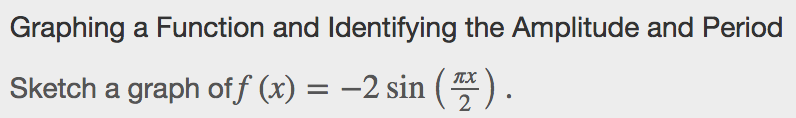
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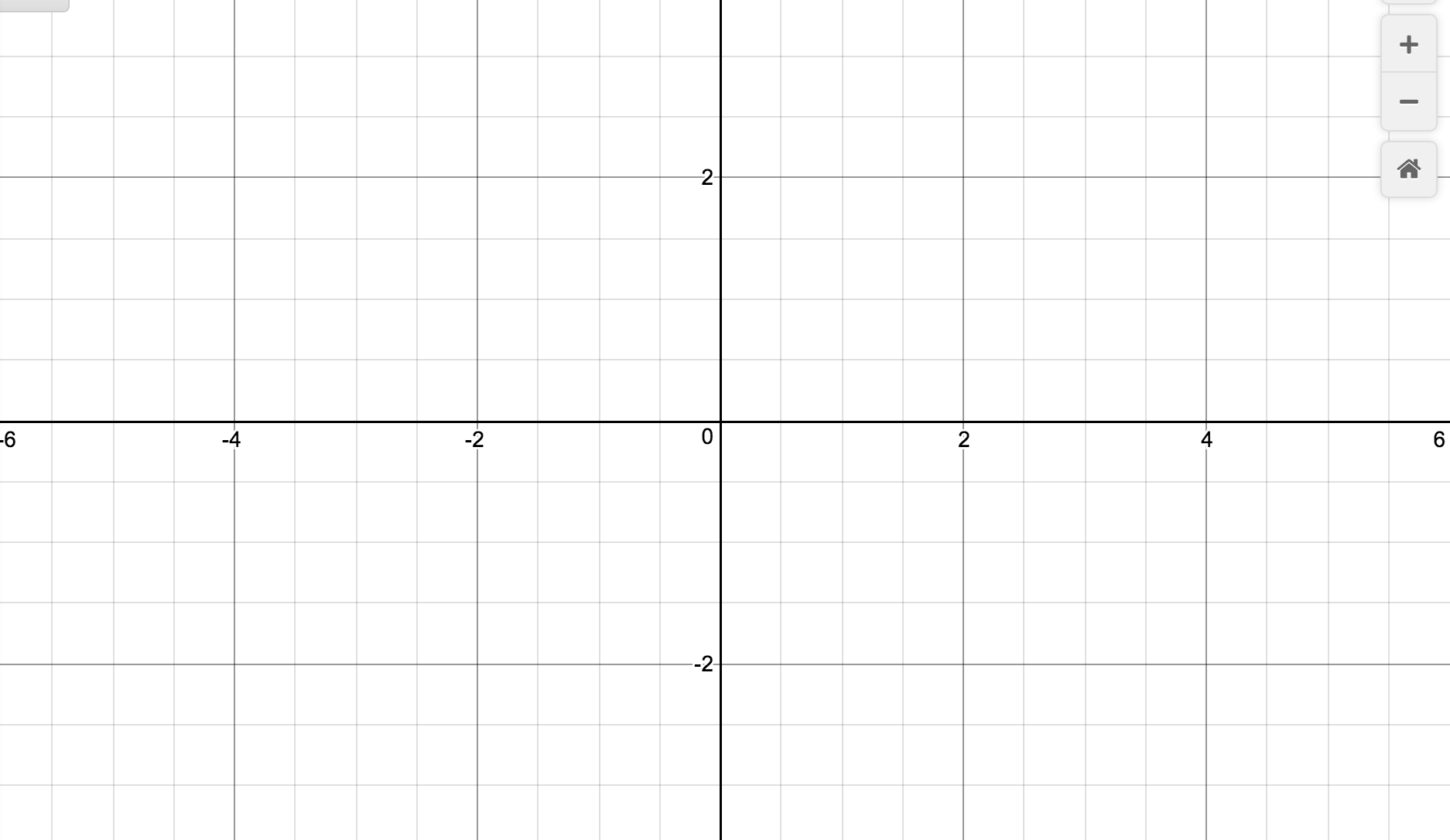
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**Graphing Variations of  and **

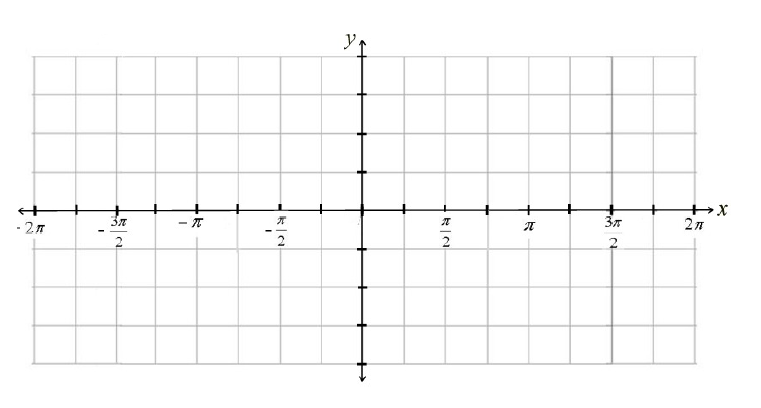
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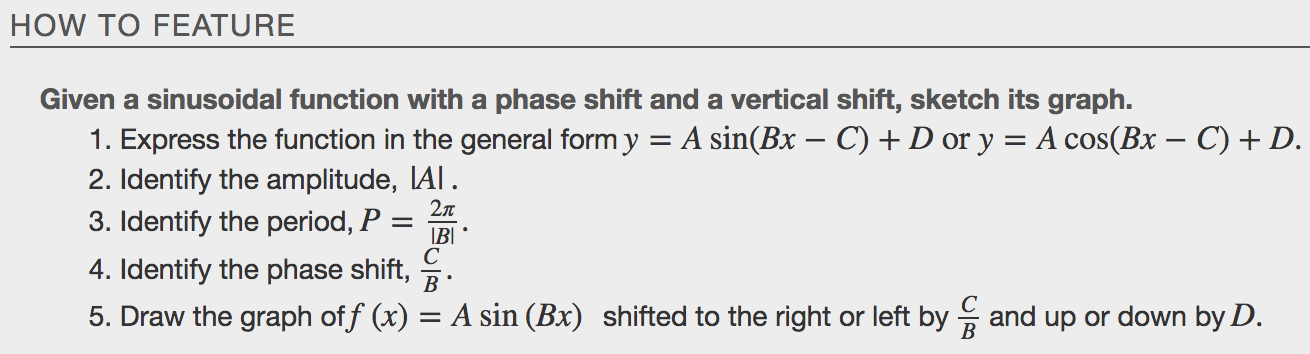
**Examples**

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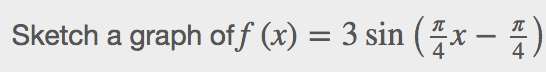
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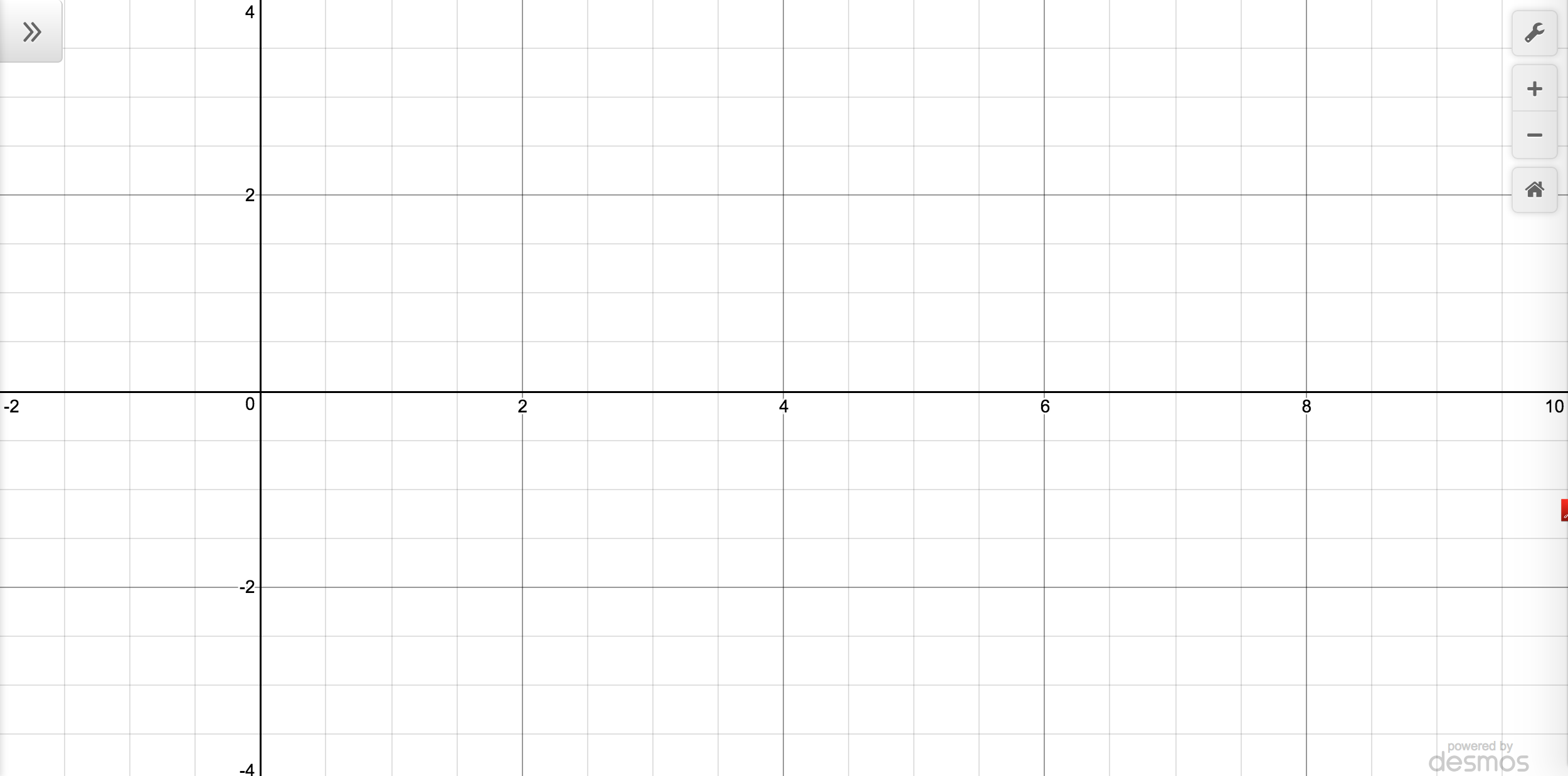
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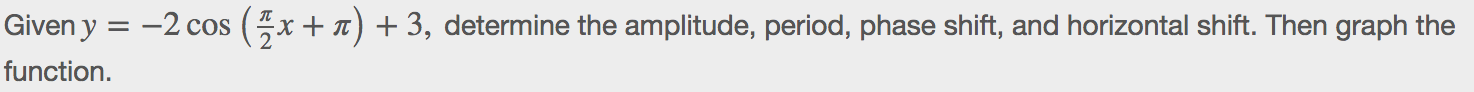


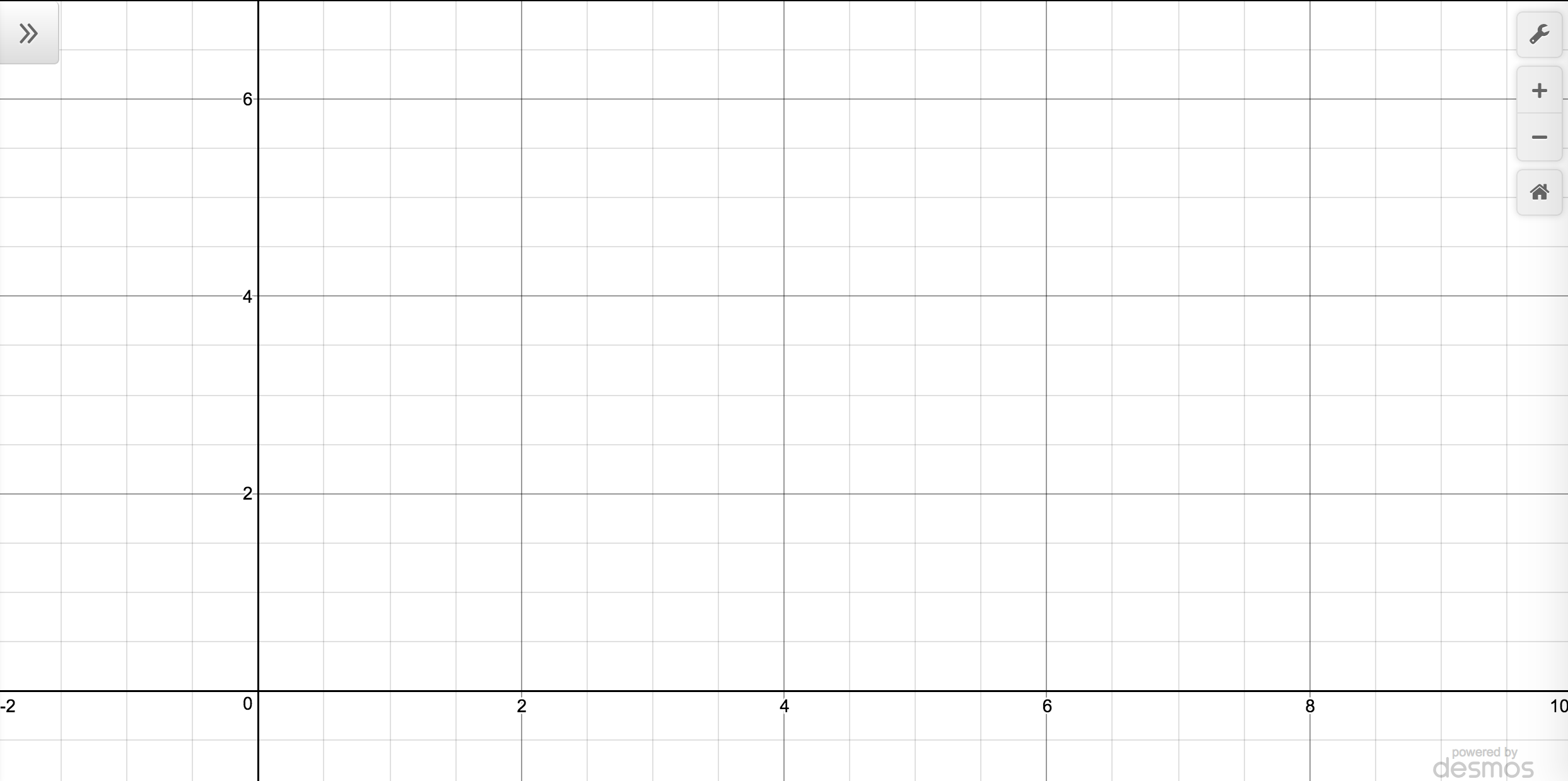
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**Examples**

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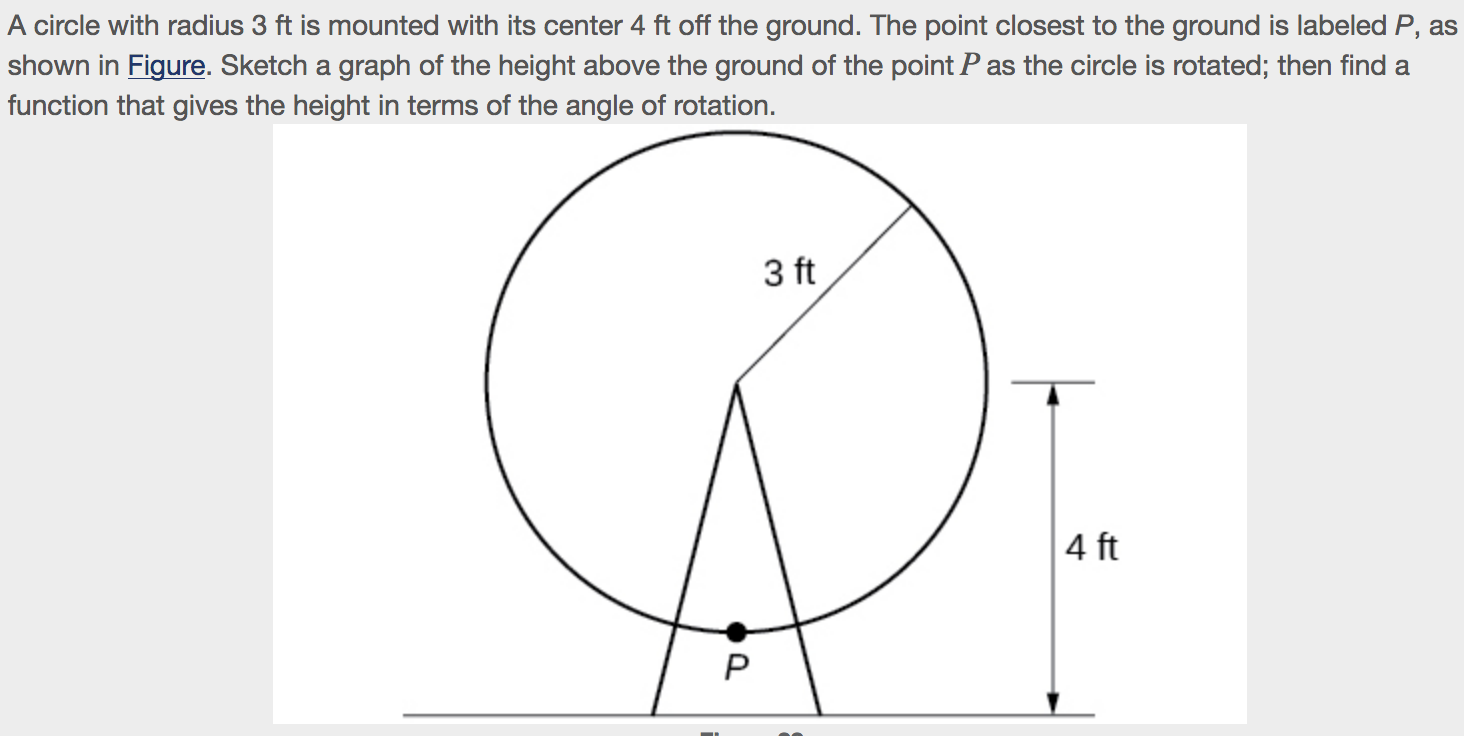
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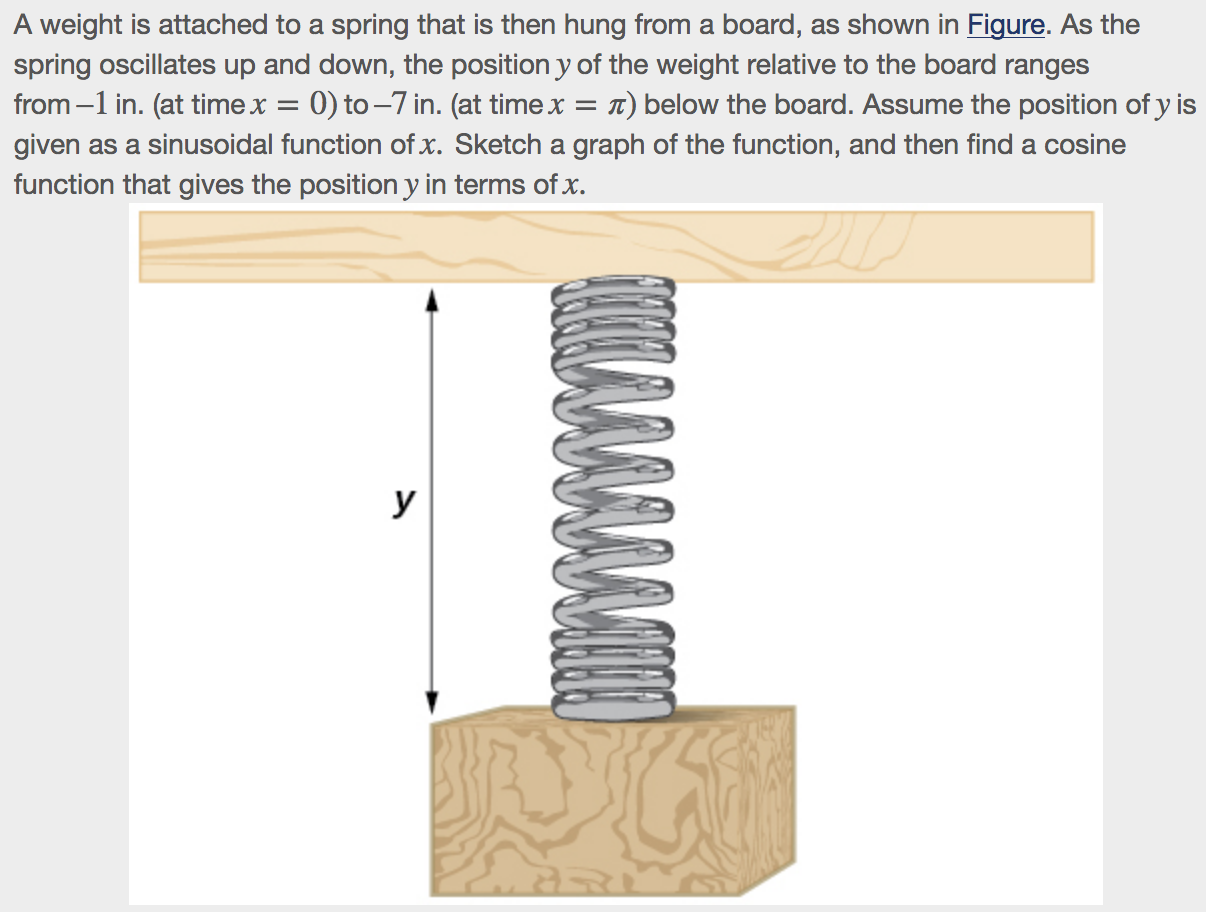
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**Using Transformations of Sine and Cosine Functions**

We can use the transformations of sine and cosine functions in numerous applications. As mentioned at the beginning of the chapter, circular motion can be modeled using either the sine or cosine function.

**Examples**

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