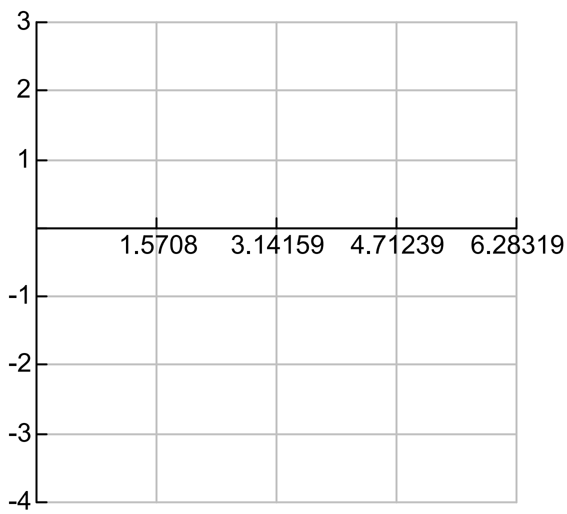
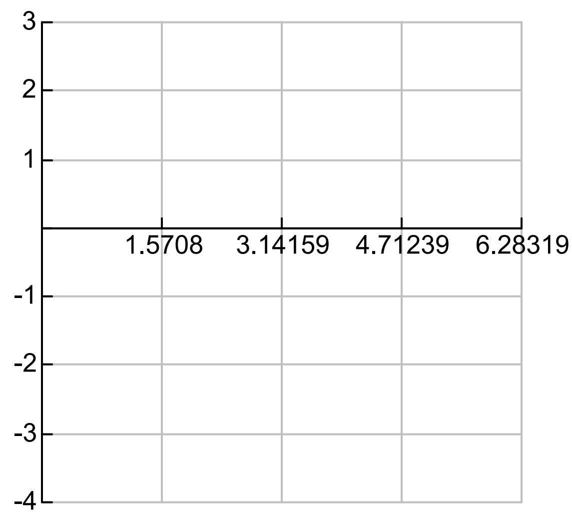
The Graphs of Sine and Cosine

Sketch the graphs of $y = \sin(x)$ and $y = \cos(x)$ on the following axes. Set your calculator to radians and set the zoom to ZOOMTRIG. We are currently only interested from 0 to 2π.

Label the points of interest on your graphs—x-intercepts, y-intercepts, maximums and minimums. This can be accomplished by using the unit circle (You will need a decimal approximation for the radians to see the value on your calculator).

Example: The calculator shows an x-intercept of (3.141592, 0). You notice that the $\sin(\pi) = 0$. So on the graph, a point should be (3.141592, 0) and it is. Label your points in terms of Pi.





In general, what will happen to the graph of a function if it is multiplied by a positive constant? Ex. $y = f(x)$ will compare how to $y = a \cdot f(x)$?

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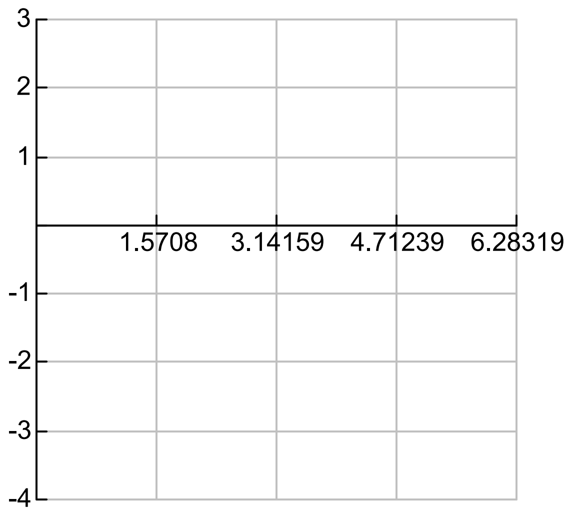
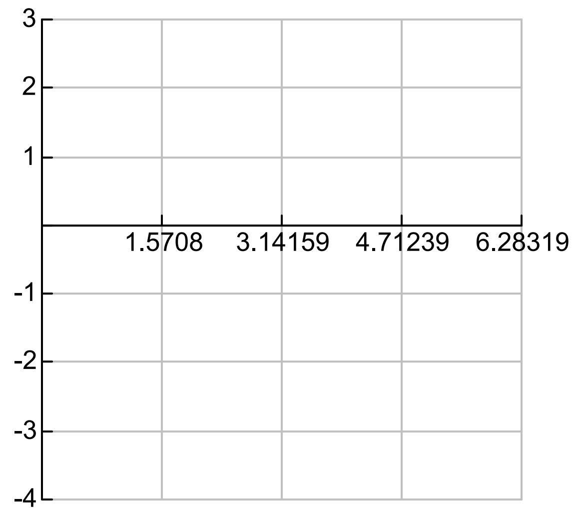
Considering what you know already, the graph of $y = a\sin(x)$ will compare how to the graph of $y = \sin(x)$ when $a > 0$?____

Will all trig functions behave similarly?____

Graph the following and label all points of interest: (in terms of Pi) (On next page)

1. $y = 2\sin(x)$
2. $y = \frac{1}{2}\cos(x)$





Describe how the graph behavior for $y = -2\cos(x)$ in comparison to $y = \cos(x)$?

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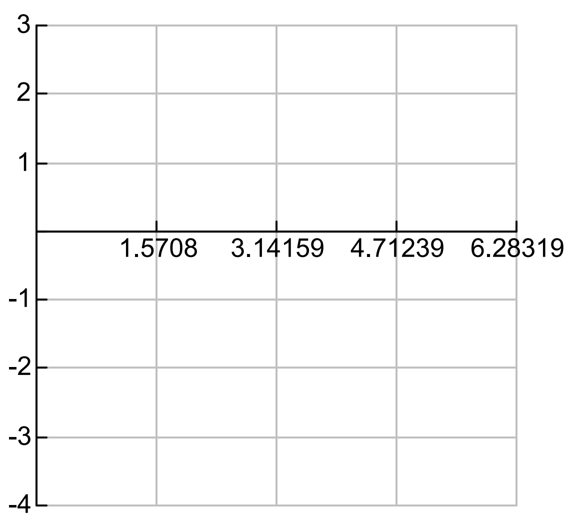
Graph to verify your conjecture: Label all points of interest



The number out in front of the trig functions seems to determine the __________________ of the function.

If the coefficient out in front is negative the graph is a ____________________________ over the _____________________________

The **amplitude** of the sine and cosine functions { $y = a\cos(x)$; $y = a\sin(x)$ } is the largest value of y (output) that is produced for all x (inputs).

Investigate: Give the amplitude of the functions sine or cosine in terms of *a*. What is the amplitude of the following functions?

1. $y = 2\sin(x)$
2. $y = -2\sin(x)$

Explain what you notice about the relationship between amplitude and the sign of a:

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WHY? Give a clear reason: ____

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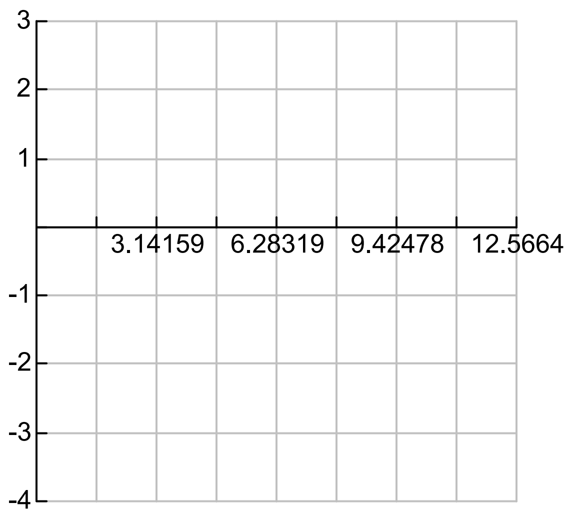
Other Types of Stretching

Compare the graph of $y = \sin(x)$ and the graph of $y = \sin\left(\frac{1}{2}x\right)$.

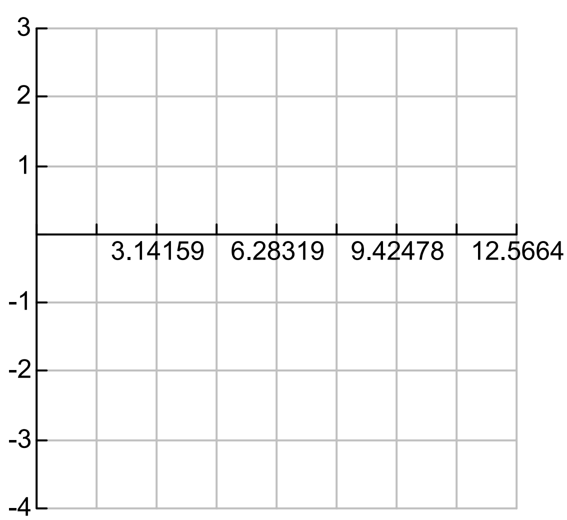


Use the same axes label the points of interest in terms of Pi.

*** Note the scale on what has been provided has changed.***

Based on the results of the last question how will the graph of $y = \cos(2x)$ compare to $y = \cos(x)$ Graph both below. Label points of interest.

The **period** of a trig function is the angle measure after which the graph begins to repeat.



Write a concise summary describing the period of the trig functions of the form $y = \cos(b \cdot x)$ or $y = \sin(b \cdot x)$ where $a>0$

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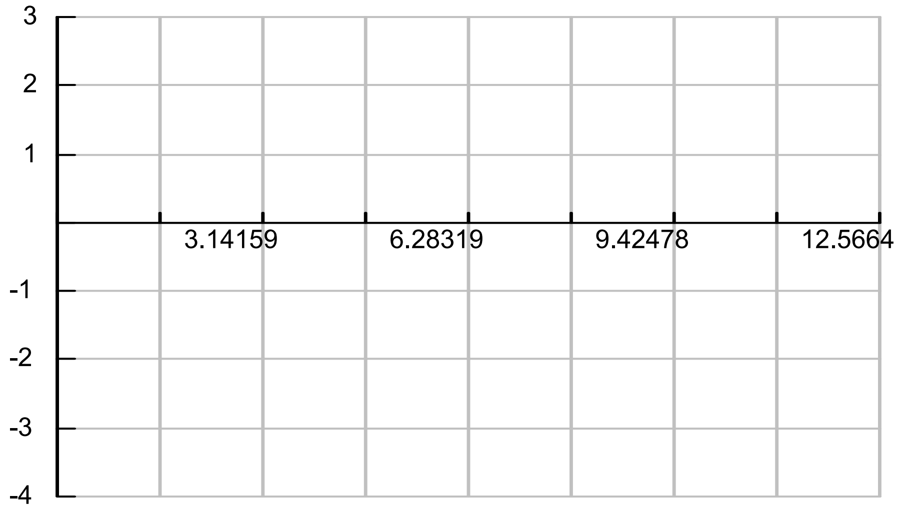
We have already investigated graphs that shift horizontally. Recall the graph of $y = f(x-2)$ will be shifted 2 units right when compared to $y = f(x)$.

Therefore, since f was any function the same will follow for trig functions.

Graph $y = \cos\left(x - \frac{\pi}{2}\right)$ and $y = \cos(x)$



Would this always be the case? We have looked at trig functions that we were able to stretch out or shrink. What if we were to combine a horizontal shift with a horizontal stretch?

Consider $y = \cos\left(\frac{1}{3}x - \frac{\pi}{3}\right)$ You know that the graph will be shifted___________________& stretched_________________________

Graph the y = cos (x). How far do you need to move the maximum point say at (0,1) until it matches up with the new graph?____

This is called the **phase shift.** Given the following $y = a \cdot \cos(b \cdot x - c)$ Determine the

1. amplitude __________________
2. period_____________________
3. phase shift__________________