

5-Point Graphing Method

Rather than using a table of many values to determine the general shape of a trig function, a convenient, 5-point method can be used when you know the functions amplitude and period.

In *sine* and *cosine* graphs, there are 5 key points that one can use to graph. These key points occur at angle values of 0° , 90° , 180° , 270° and 360° .

One reason why these are key points is because, each cycle of a sine or cosine function includes a maximum, a minimum and three zeros.

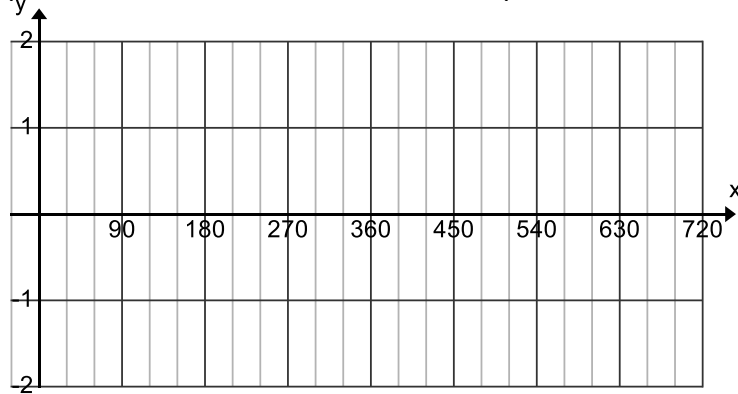
Notice that the angle values are equally spaced apart. The key points split the function's period into quarters: $\frac{360^\circ}{4} = 90^\circ$ (key points occur every 90°)

The "Sinusoidal Axis" is the horizontal line halfway between the maximum and the minimum.

Example 1:

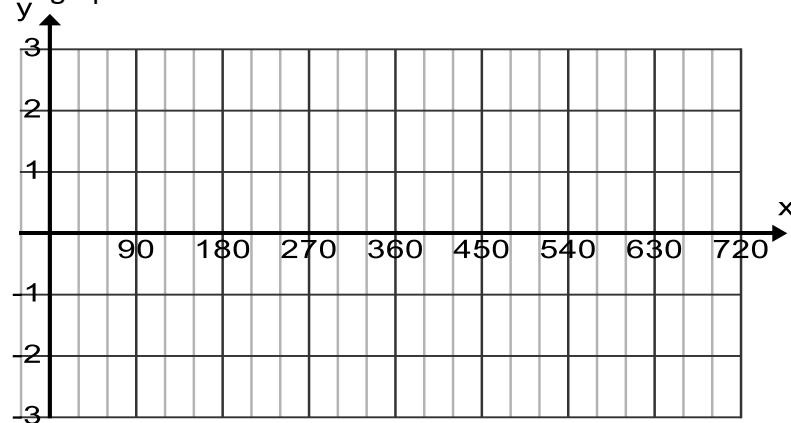
Use the 5-Point method to graph the sine and cosine functions for 2 periods.

| x | $\sin x$ | $\cos x$ |
|-------------|----------|----------|
| 0° | | |
| 90° | | |
| 180° | | |
| 270° | | |
| 360° | | |

**Vertical Stretch**

Complete the table of values and graph both curves on the same axis.

| x | $\sin x$ | $3 \sin x$ |
|-------------|----------|------------|
| 0° | | |
| 90° | | |
| 180° | | |
| 270° | | |
| 360° | | |

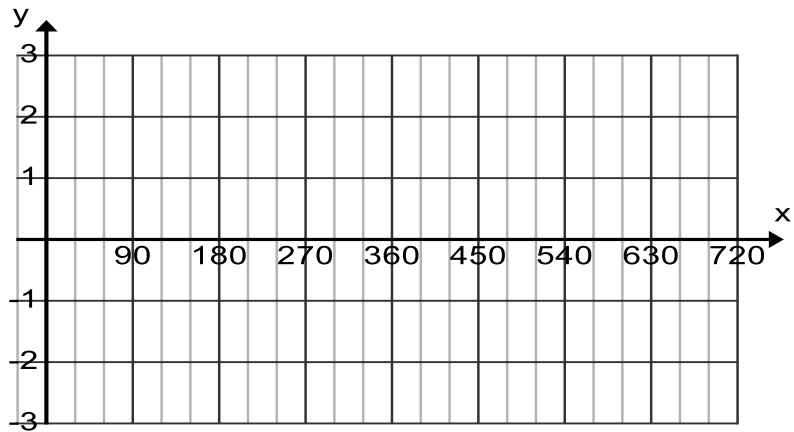


How do the amplitudes of each graph relate to each other?

Vertical Compression

Complete the table of values and graph both curves on the same axis.

| x | $\cos x$ | $\frac{1}{2} \cos x$ |
|-------------|----------|----------------------|
| 0° | | |
| 90° | | |
| 180° | | |
| 270° | | |
| 360° | | |



How do the amplitudes relate to each other?

In general:

Transformations that applied to $f(x)$, also apply to trig functions:

For functions in the form $y = a \sin x$ or $y = a \cos x$,

- If $|a| > 1$, the graphs are vertically stretched by a factor of $|a|$
- If $0 < |a| < 1$, the graphs are vertically compressed by a factor of $|a|$
- *Amplitude* becomes $|a|$. (max is $|a|$, min is $-|a|$)
- *Period* is unchanged

Example: Graph one cycle of $y = 5 \sin x$.

