# Trigonometric Graphs

In National 5 maths you are required to interpret different trigonometric graphs, in particular sine and cosine graphs.

Below in Figure 1 is a graph of $y = \sin x$, the graph has a maximum of 1 and a minimum of -1. The graph repeats every 360°.

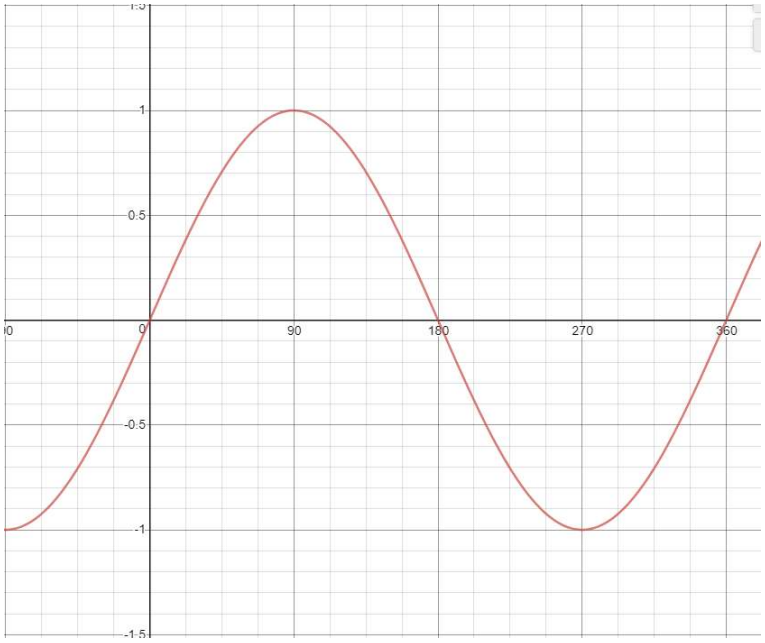



*Figure 1 Sine Graph*

mearnsmaths@gmail.com
07986 201 641

In Figure 2 a graph of $y = \cos x$ is shown. Here again the maximum value is 1 and the minimum is -1. Notice that this graph is like the sine graph but moved over by 90°.

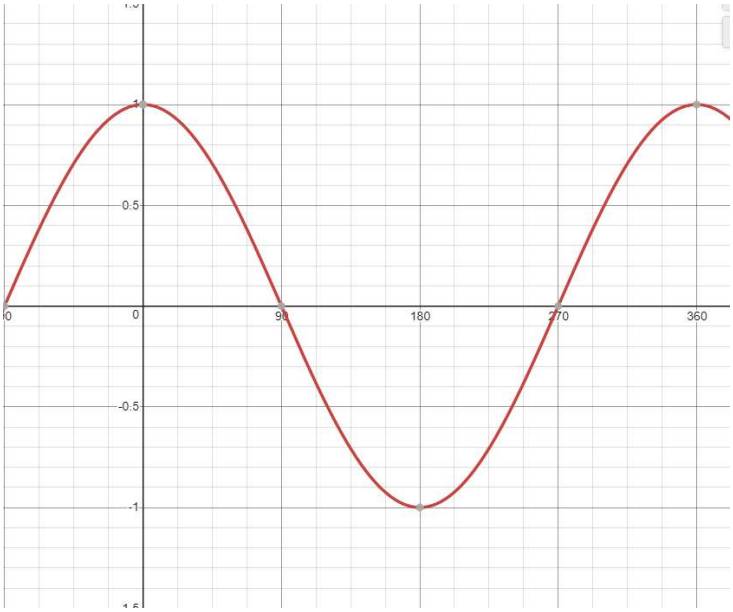



*Figure 2 Cosine Graph*

In Nat 5 maths you will be asked to interpret these graphs after they have been altered. Typically, you will be given a function in the form of $y = a \sin bx + c$ and you will be asked to identify a, b and c.

mearnsmaths@gmail.com
07986 201 641

First, we will look at what happens to the graphs when the value of a changes.

For the function $y = 2\sin x$ we get the graph shown below. Notice the only change to the graph is that it now has a maximum of 2 and a minimum of -2. The original graph has been multiplied by 2 and the number of waves remains the same.

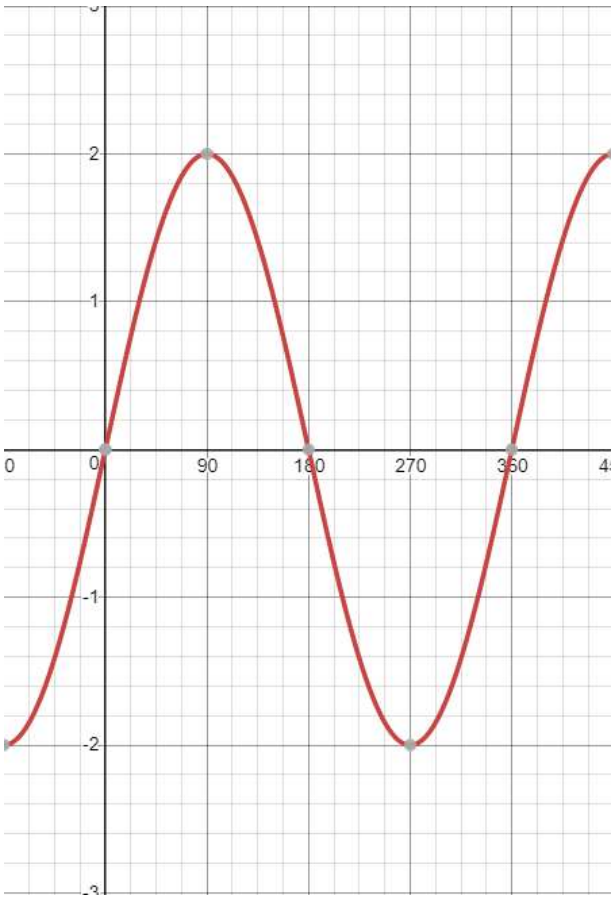



*Figure 3 Graph of y = 2sin x*

mearnsmaths@gmail.com
07986 201 641

Examples:

For each of these functions what is the maximum and minimum value?

1) $y = 5\cos x$

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

3) $y = 7\cos x$

4) $y = \frac{3}{2}\cos x$

5) $y = 10\sin x$

mearnsmaths@gmail.com
07986 201 641

Now to look at what happens when the value for b is changed.

The function below shows $y = \sin 2x$. The graph still has a maximum of 1 and a minimum of -1 but over the period of 360° we now have 2 complete waves rather than 1.

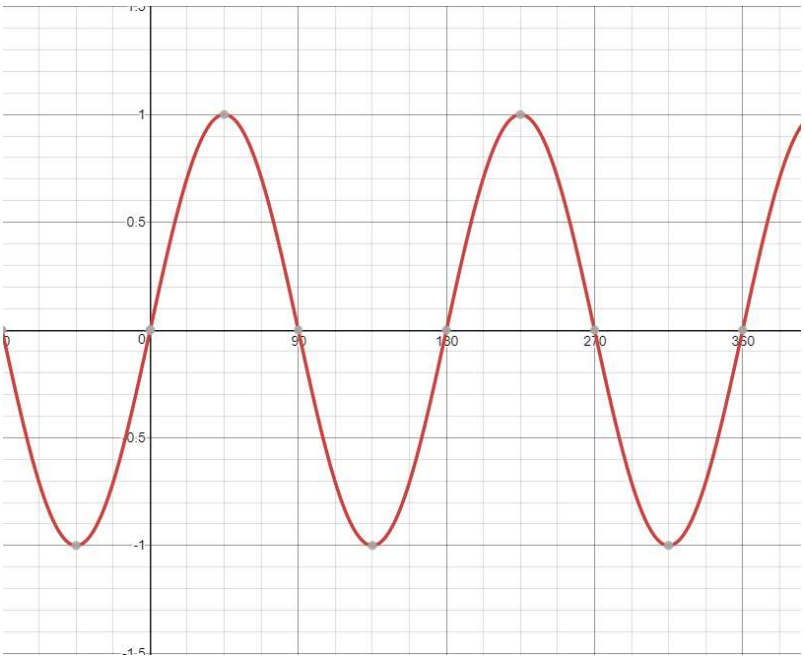



*Figure 4 y = sin 2x*

Examples:

How many complete waves would you expect to find in the following functions?

1) $y = \sin 4x$

2) $y = \cos 10x$

3) $y = \sin \frac{1}{2}x$

4) $y = \cos 3x$

mearnsmaths@gmail.com
07986 201 641

Lastly what happens when the value for c is changed? The value for c moves the function vertically up or down. For the function $y = \sin x + 2$ the graph moves vertically up by 2 units, there is still 1 complete wave in 360°. The values on the y-axis are no longer 1 and -1 but 1 and 2, the minimum and maximum have increased by 2.

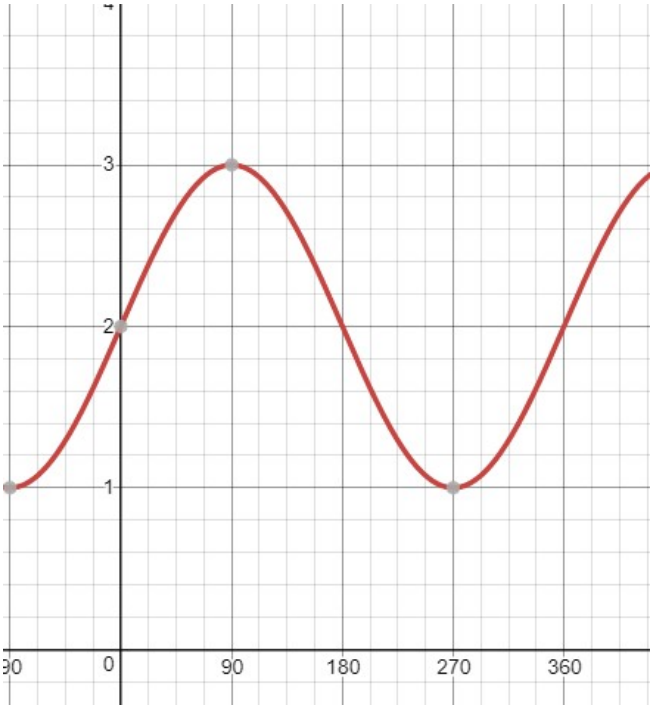



*Figure 5 y = sin x + 2*

Examples

What will the maximum and minimum values be for the following functions?

1) $y = \cos x + 1$

2) $y = \sin x + 3$

3) $y = \sin x + 6$

4) $y = \cos x - 2$

mearnsmaths@gmail.com
07986 201 641

Pulling it all together we can now interpret functions such as $y = 5\sin 2x + 4$. This graph will be multiplied by a factor of 5 with 2 complete waves in 360° and shifted vertically up by 4. The minimum value will be -1 and the maximum value will be 9.

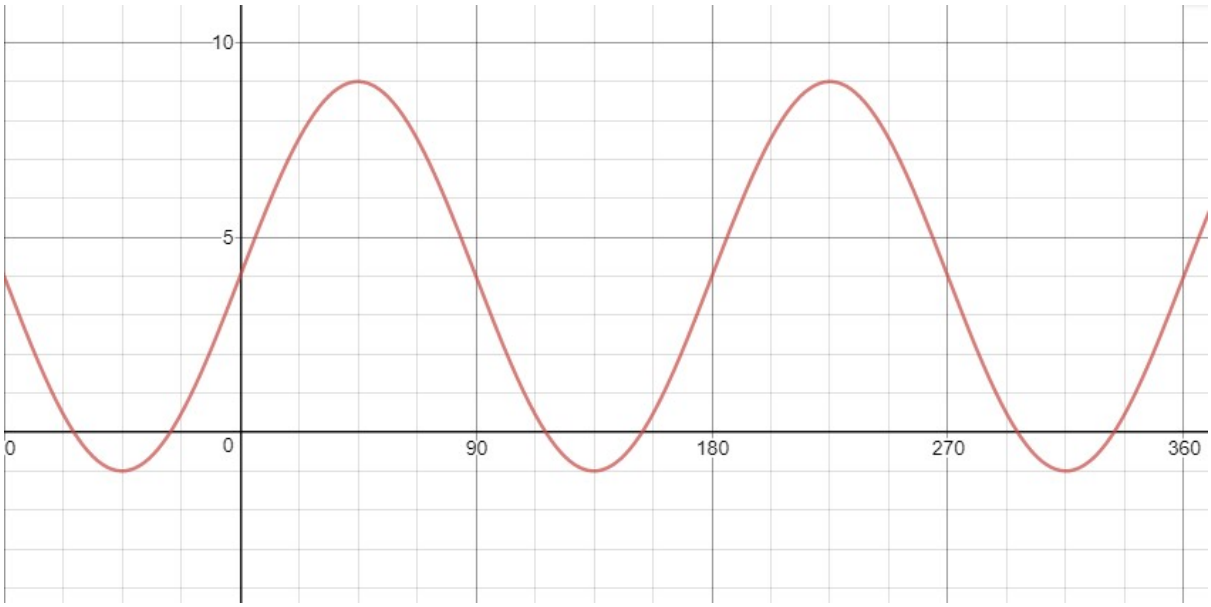


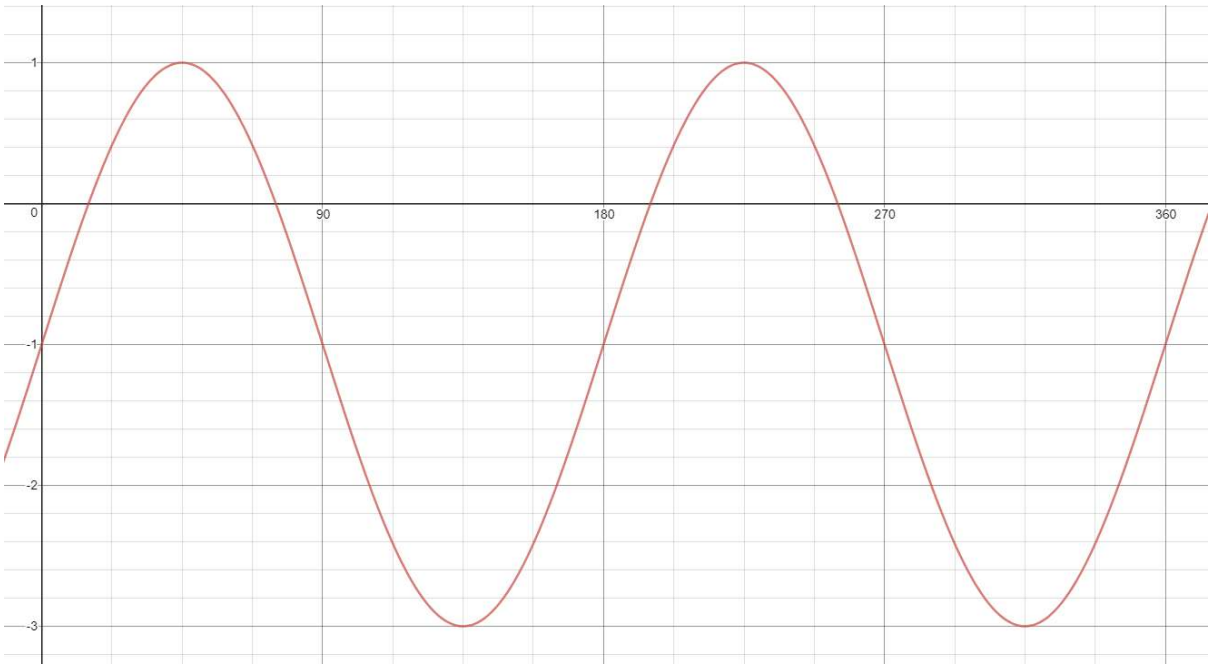

*Figure 6 Graph of y = 5 sin 2x + 4*

mearnsmaths@gmail.com
07986 201 641

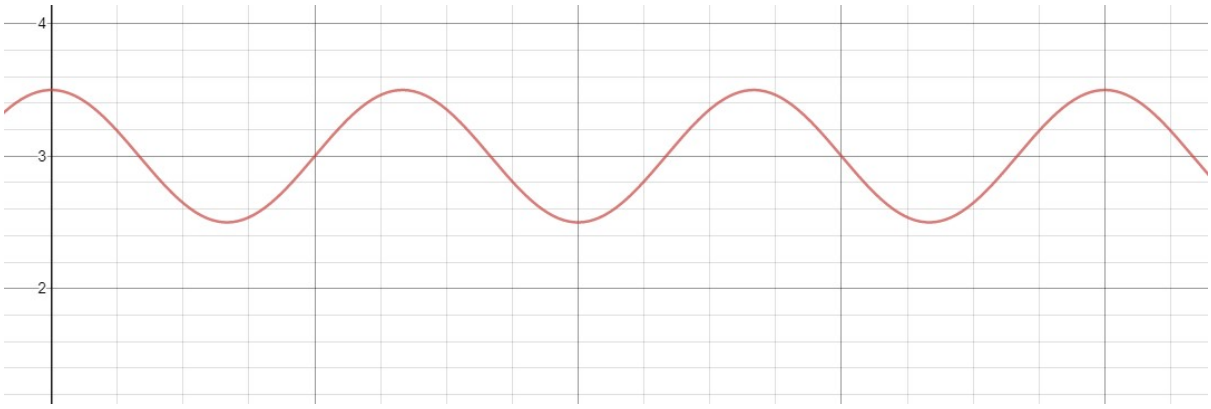
Examples

Find the values of a, b and c for each of these functions where the functions are in the form $y = a \sin bx + c$

1)

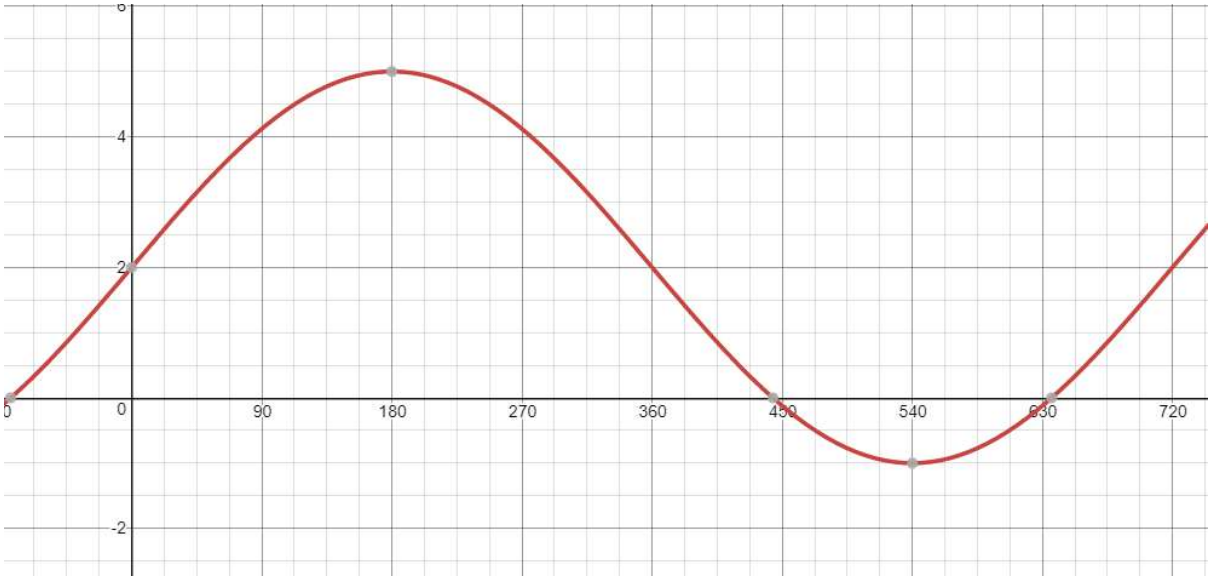



2)

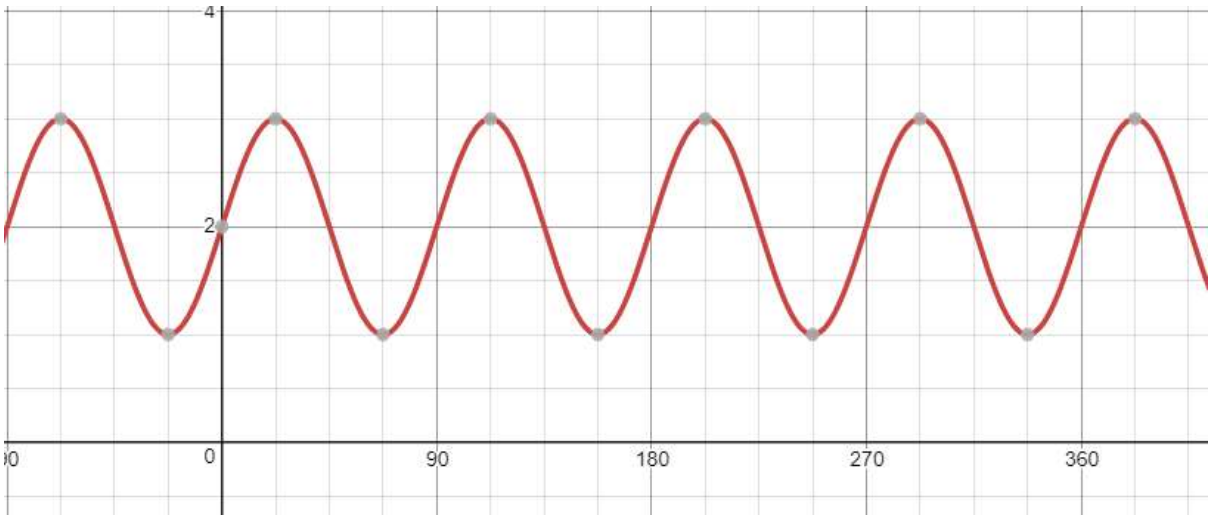



mearnsmaths@gmail.com
07986 201 641

3)




4)




mearnsmaths@gmail.com
07986 201 641