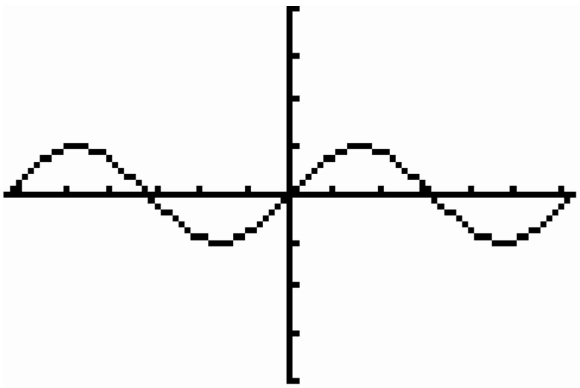
Investigating the graphs of trigonometric functions

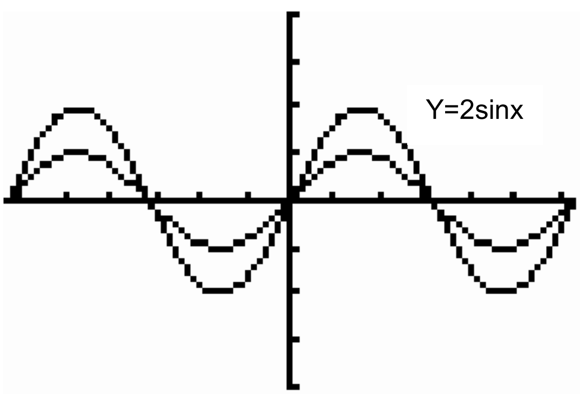
Y=Sin x



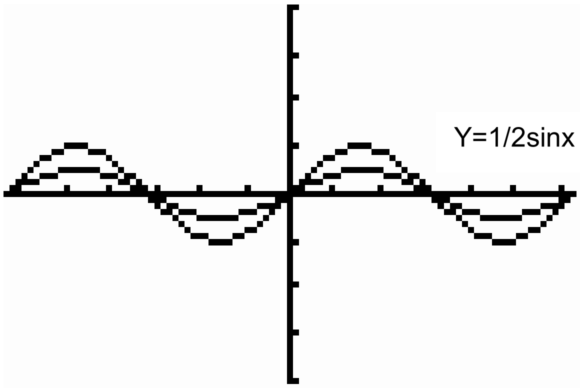
On the above, a normal sin curve on a scale of -2π<x<2π and -4<y<4

The curve shows an amplitude of 1 since the crest-the centreline gives a value of 1.

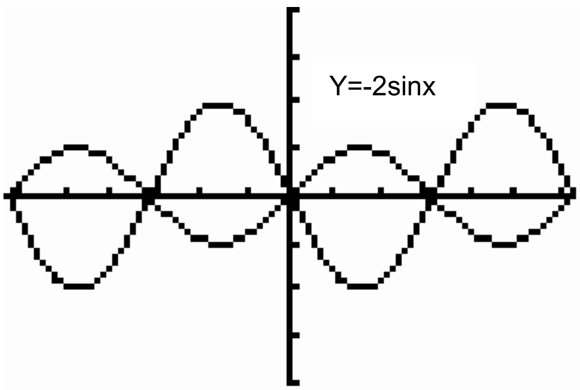
The curve also makes 2 cycles which represents a period of (4π)/2=2π.



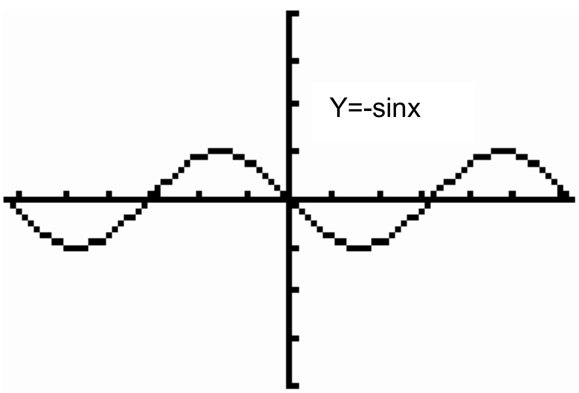
Y=2sinx, we observe an amplitude of twice the original size, here the value 2 in 2sinx is twice 1 in sinx therefore the curve stretches vertically with an amplitude of 2.



Y=1/2sinx, we observe an amplitude of half the original size, here the value 1/2 in 1/2sinx is half 1 in sinx therefore the curve contracts vertically with an amplitude of 1/2.



Y=-2sinx, we observe an amplitude of twice the original size, here the value 2 in 2sinx is twice 1 in sinx therefore the curve Stretches vertically with an amplitude of 2. However, as per the minus sign, we see that the curve is reflected through the centreline at 0.

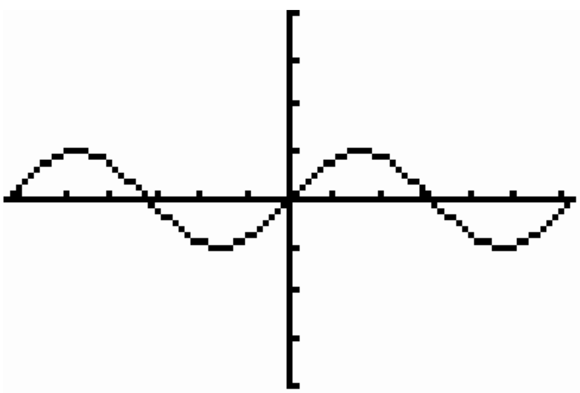


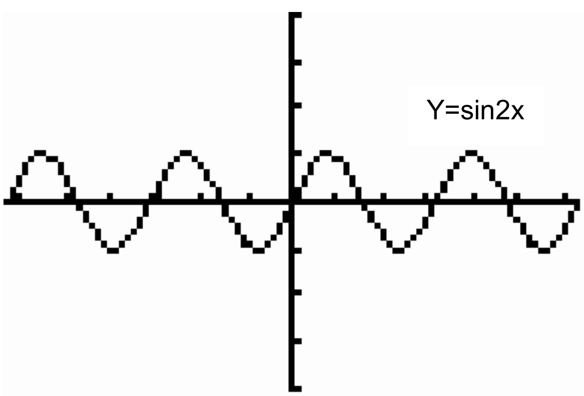
For example, in y=-sinx, we find that the minus sign makes the sign curve reflect throughout the centreline and that the curve is the exact inverse of a normal sine curve.

Therefore, considering the formula Y=a sin bX + c, we find that the letter a modifies the amplitude of the curve. For instance, if we increase its value, the curve will vertically stretch with an amplitude of the same value. If however we reduce the value, then the curve will vertically contract with an amplitude of the same value. Finally, if we inverse the sign of the amplitude for example we change ‘a’ into ‘-a’, then the curve will reflect through the centreline.

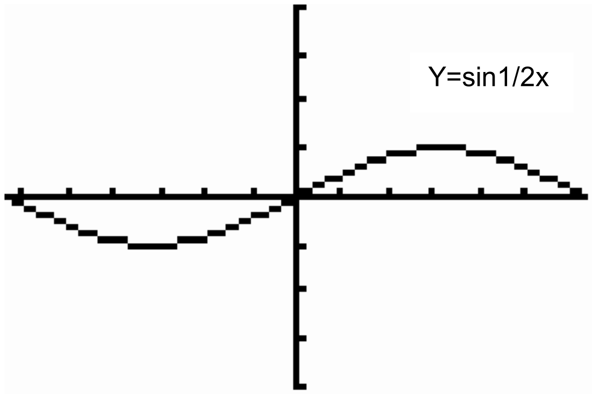
If we consider an infinitely extended graph, then we could say that the values of ‘a’ could be infinite apart from zero as the curve would vertically stretch or contract at any number apart from zero.

Y=Sin bX   b=1

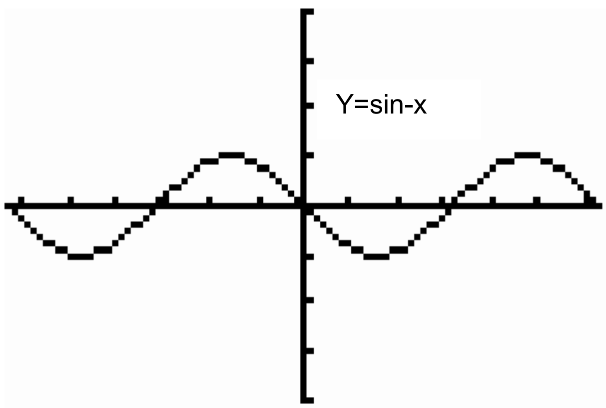




Y=sin2x, we observe that within the same domain, we get 4 cycles instead of 2. Hence, we could say that when b=2, we get a period of 4π/4 instead of 4π/2. Hence when we increase the value of b, the period decreases. The curve also contracts horizontally.



Y=sin1/2x, we observe that within the same domain, we get 1 cycle instead of 2. Hence, we could say that when b=1/2, we get a period of 4π/1 instead of 4π/2. Hence when we half the value of b, the period doubles. The curve also stretches horizontally.

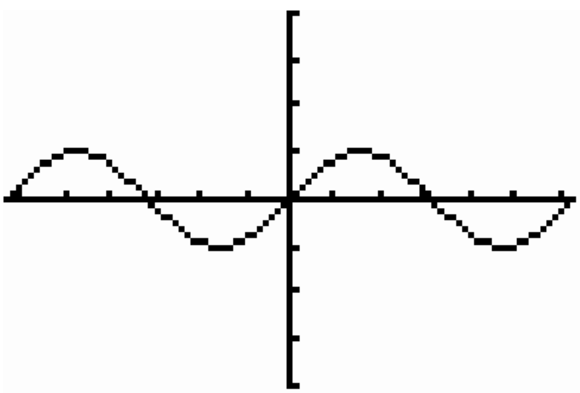


Y=sin-x, we find that the minus sign makes the sign curve reflect throughout the centreline and that the curve is the exact inverse of a normal sine curve. Therefore, y=sin-x is exactly the same as y=-sinx.

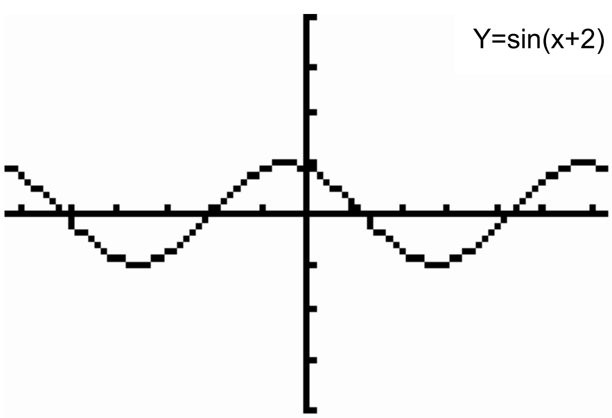
For instance, considering the formula Y=a sin bX + c, we find that the letter ‘b’ modifies the period of the curve. For instance, if we increase its value, the curve will horizontally contract with a period of the same value. If however we reduce the value, then the curve will horizontally stretch with a period of the same value. Finally, if we inverse the sign of the period for example we change ‘b’ into ‘-b’, then the curve will reflect through the centreline.

If we consider an infinitely extended graph, then we could say that the values of ‘b’ could be infinite apart from zero as the curve would horizontally stretch or contract at any number apart from zero.

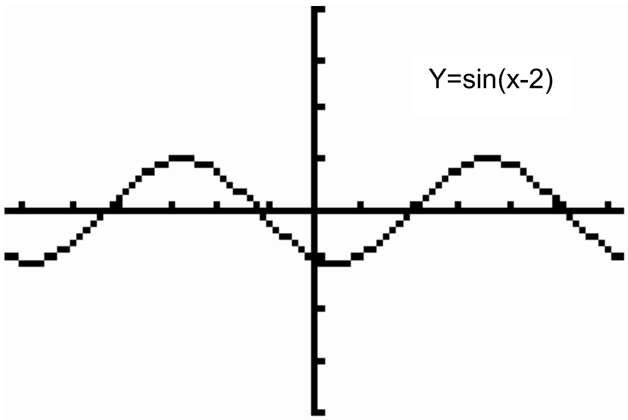
Y=Sin X + c c=0



Y=sin(x+2)



Y=sinx+2, we observe by increasing the magnitude of c by 2, the curve experiences a horizontal translation to the left by scale factor 2.



Y=sinx-2, we observe by increasing the magnitude of c by 2 but reversing the sign, the curve experiences a horizontal translation to the right by scale factor 2.

Hence, we can see that adding or subtracting ‘c’ results in an leftward and rightward translation of the curve. The curve is translated horizontally by a scale factor of the magnitude of ‘c’. The positive value translates to the left while a negative value translates to the right.

The possible values of c could be infinite as there can be an infinite translation of the curve.

To conclude, we should say that we can predict the shape and position of the graph of y=Asin(B(x+C) from the above information on A, B and C. We could say anticipate the vertical stretch of the curve by modifying the magnitude of A and inverse it by making A negative. Also, we could increase or decrease the cycles of the curves according to its period by changing the value of B. Finally, we could decide the horizontal translation of the curve to the left by adding a given C value or to the right while subtracting a given value of C.