IBHL Transformation of Trig Curves Revision

ibhltrigtransform.doc

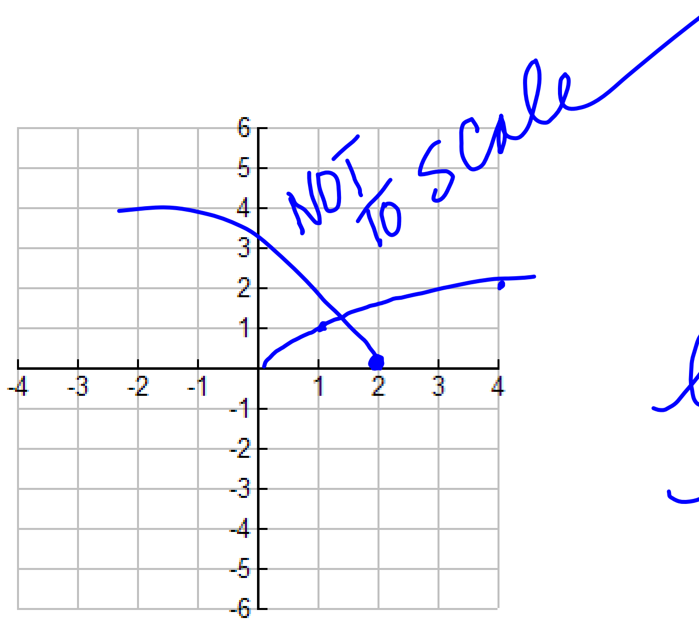
Before we start, let's do a few more non-trig problems.

Define the transformations which will transform the graph of $y = \sqrt{x}$ into the graph of $y = 3\sqrt{a - x}$, where a is a constant. Sketch the two graphs on the same axes.

Reflect in y-AXIS $\sqrt{x} \mapsto \sqrt{-x}$

TRANSLATE a UNITS horizontally

Vert. STRETCH by 3



let $a=2$ for this GRAPH only

Let $g : x \mapsto \frac{1}{x}, \quad x \neq 0$

The graph of g is transformed to the graph of h by a translation of 4 units to the left and 2 units down.

Find an expression for the function h.

$h(x) = \frac{1}{x}$ becomes $h(x) = \frac{1}{x+4}$

becomes $h(x) = \frac{1}{x+4} - 2$

$\left(0, -\frac{7}{4}\right)$

Find the intercepts of h

$\left(-\frac{7}{2}, 0\right)$

$0 = \frac{1}{x+4} - 2$

$2 = \frac{1}{x+4}$

hence $x = -\frac{7}{2}$

$h(0) = \frac{1}{0+4} - 2$

$h(0) = -\frac{7}{4}$

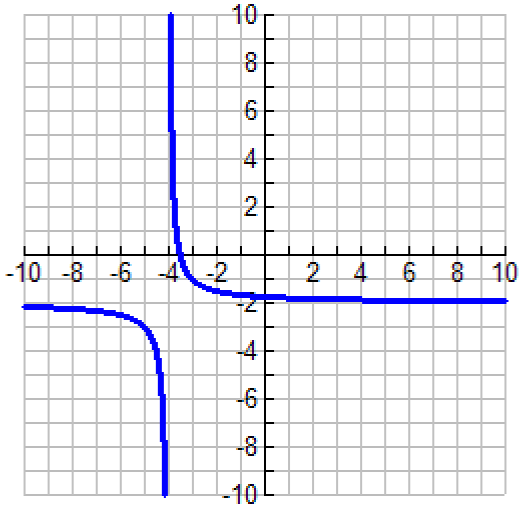
hence $y = -\frac{7}{4}$

Write down the equations of the asymptotes of h

$x = -4 \qquad y = -2$

Sketch the graph of h

My graph is on the next page



Let the function $y = x^2$ be transformed [transfigured?] by the following:

A reflection in the line $y = 0$ ✓

A vertical stretch by scale factor of $\frac{1}{2}$ ✓

A horizontal translation of $p = -5$ ✓

A vertical translation of 3 units ✓

$y = x^2$

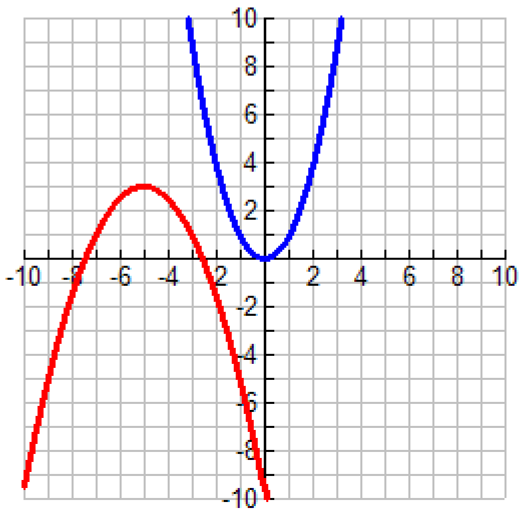
$y = -x^2$

$y = -\frac{1}{2}x^2$

$y = -\frac{1}{2}(x+5)^2$

$y = -\frac{1}{2}(x+5)+3$

Find the resulting function and graph it on the same axes as $y = x^2$ [My graph is on the next page]



And now onto the transformation of trigonometric curves

First let's look at the ibhltrigtransform.ppt slide show

Summary

- in $y = A\sin x$, A affects the amplitude and the amplitude is $|A|$
- in $y = \sin Bx$, $B > 0$, B affects the period and the period is $\dfrac{2\pi}{B}$.

- $y = \sin(x - C)$ is a **horizontal translation** of $y = \sin x$ through C units.
- $y = \sin x + D$ is a **vertical translation** of $y = \sin x$ through D units.
- $y = \sin(x - C) + D$ is a **translation** of $y = \sin x$ through vector $\begin{bmatrix} C \\ D \end{bmatrix}$.

OR $\begin{pmatrix} C \\ D \end{pmatrix}$

Now let's put it all together with some standard exam questions.

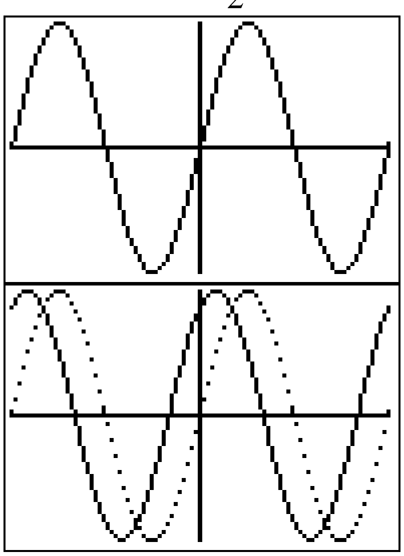
Consider $y = \sin\left[2\left(x + \frac{\pi}{3}\right)\right]$

Let's describe the transformation from $y = \sin x$ to $y = \sin\left[2\left(x + \frac{\pi}{3}\right)\right]$

We can think of the form $y = a\sin[b(x + c)] + d$

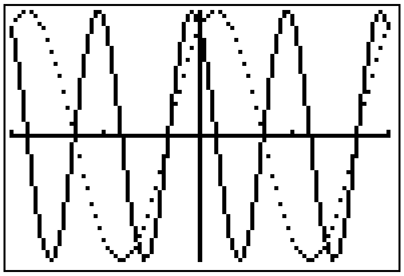
In this case, $a = 1 \; and \;\; d = 0$

First we need to translate the graph of $y = \sin x$ to the left $\frac{\pi}{3}$ units and then a horizontal shrinking by a factor of $\frac{1}{2}$



$y = \sin x$

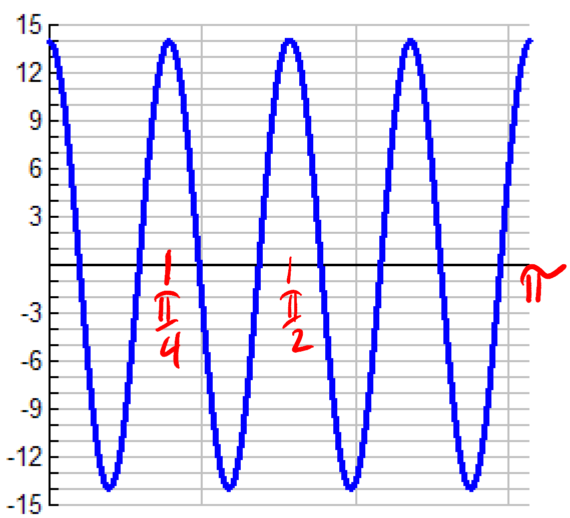
$y = \sin\left(x + \frac{\pi}{3}\right)$
[$y = \sin x$ is Dotted]



$y = \sin\left(2\left(x + \frac{\pi}{3}\right)\right)$

[$y = \sin\left(x + \frac{\pi}{3}\right)$) is Dotted]

The graph of a function in the form of $y = a\cos(bx)$ is shown below. Find the values of a and b



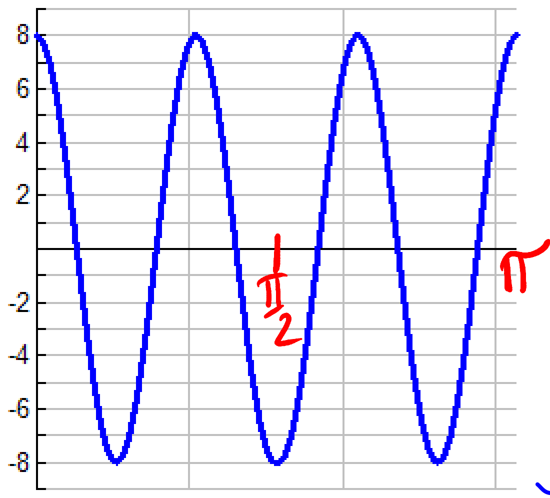
$y = a\cos(bx)$

amp $= 14$

period $= \frac{2\pi}{b} = \frac{\pi}{4}$

$b = 8$

The graph of a function in the form
$y = p\cos(qx)$ is shown below. Find p & q



$y = p\cos(qx)$

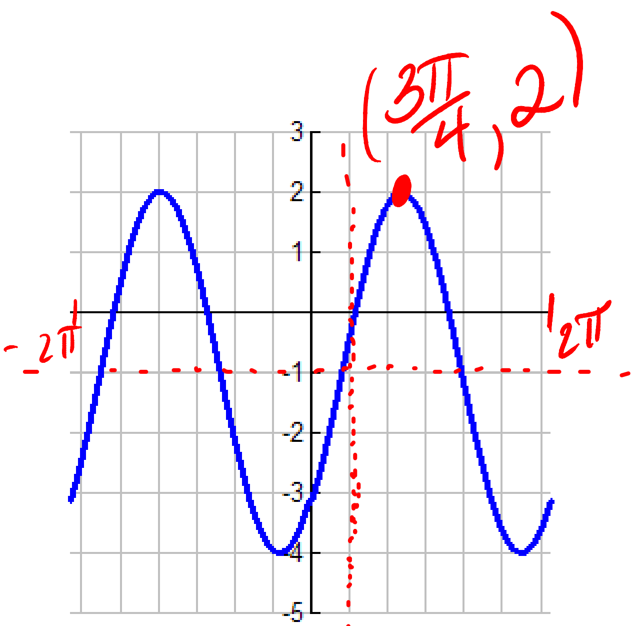
amp $= 8$

period $= \frac{2\pi}{b} = \frac{\pi}{3}$

$b = 6$

The graph below represents $y = a\sin(x+b)+c$

Find the values of a, b , *and* c



amp $= 3$

$c = -1$

$a = 3$

$b = -\frac{\pi}{4}$