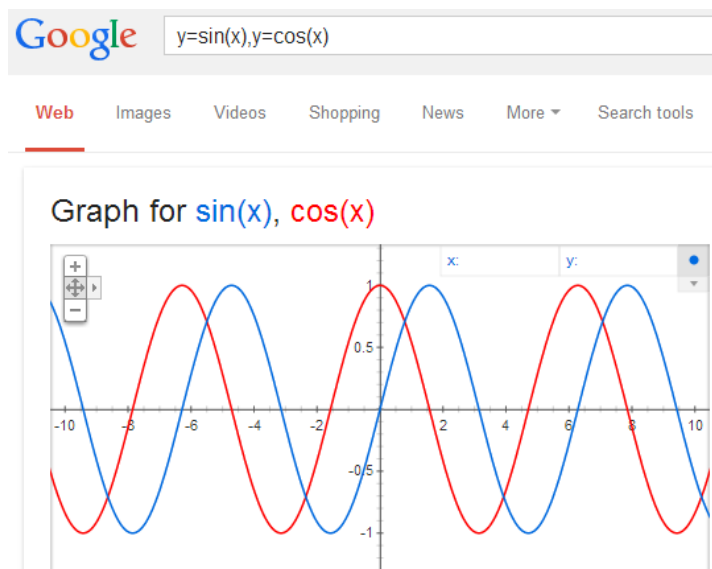# Graph Transformations Investigation
with Google's graphical calculator

Google incorporates a sophisticated calculator into its search engine. If you type something into the search box that Google interprets as the equation of a curve it will show it before the main search results.

By separating equations with commas, up to four different curves can be shown simultaneously.

Google | y=sin(x),y=cos(x)

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Graph for sin(x), cos(x)

Note: symbols are designed for keyboards:
$\frac{x^3}{4} + 2\sin x$ is written as: (x^3)/4+2*sin(x)

Use the Google graphing function to investigate the following transformations.
Describe the change you notice in the graph as geometric transformations
(eg "stretch of scale factor a in the x direction" or "translation of a upwards")

Transformation to investigate	Description of transformation
$y = f(x)$ transformed to $y = f(x) + a$ Eg: $y = \sin(x) \quad \longrightarrow \quad y = \sin(x) + 2$	
$y = f(x)$ transformed to $y = f(x + a)$ Eg: $y = 3x^2 - 2x \quad \longrightarrow \quad y = 3(x + 5)^2 - 2(x + 5)$	
$y = f(x)$ transformed to $y = af(x)$ Eg: $y = x^3 - 2x \quad \longrightarrow \quad y = 6(x^3 - 2x)$	
$y = f(x)$ transformed to $y = f(ax)$ Eg: $y = \cos(x) \quad \longrightarrow \quad y = \cos(2x)$	

Extension: consider the last two transformations with $a = -1$. What do you notice?