MCR 3U
5.4

Modelling with the Sine and Cosine Functions

y = sin(kx)

Horizontal Stretches/Compressions

if $k > 1$, then the period is shortened by a factor of k.
if $k < 1$ then the period is lengthened

$$y = \sin(kx)$$

* The k-value either shortens or lengthens the period *

How does the k-value affect the period of the graph?

eg. a) $y = \sin(2x)$ $\quad k = 2$ $\quad P = \frac{360}{2} = 180^\circ$

$$Period = \frac{360^\circ}{k}$$

b) $y = \sin(.25x)$ $\quad k = 0.25$ $\quad P = \frac{360}{0.25} = 1440^\circ$

c) $y = \cos(3x + 180)$ $\quad \cos[3(x+60)]$ $\quad P = \frac{360}{3} = 120^\circ$

Determining the Period

eg. State the period of each function.

a) $y = \sin\left(\frac{1}{3}x\right)$ $\quad P = \frac{360}{\frac{1}{3}} = 360 \times \frac{3}{1} = 1080^\circ$

b) $y = \cos\left(\frac{3}{2}x\right)$ $\quad P = \frac{360}{\frac{3}{2}} = 360 \times \frac{2}{3} = 240^\circ$

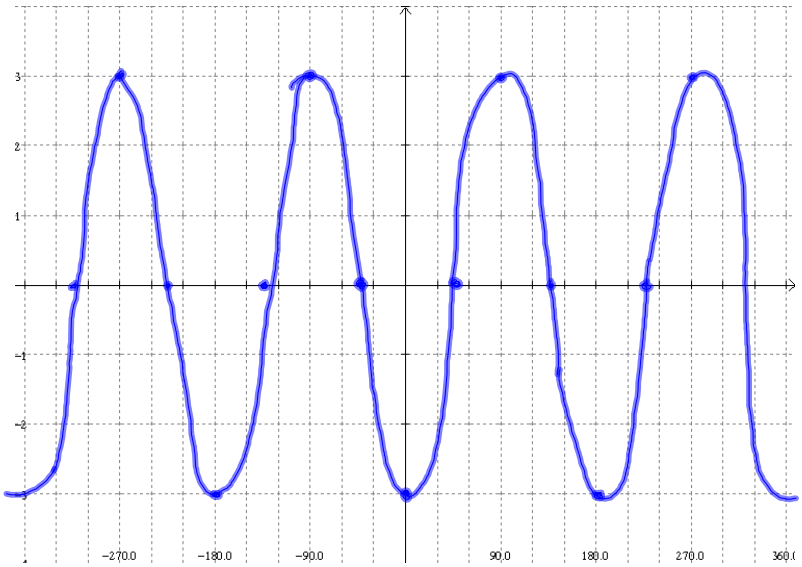
Putting it All Together

Complete the table for each function and then graph the function between $-360^\circ \le x \le 360^\circ$

	$y = 3\cos(2x + 180^\circ)$ $= 3\cos[2(x + 90)]$	Click Me!
Amplitude	3	2
Phase Shift	left 90°	left 60°
Sinusoidal Axis	$y = 0$	$y = -1$
Period	180° $P = \frac{360}{2} = 180^\circ$	$P = \frac{360}{\frac{3}{4}}$ $360 \cdot \frac{4}{3} = 480^\circ$

a) $y = 3\cos(2x + 180^\circ)$

b) $y = 2\sin\frac{3}{4}(x + 60^\circ) - 1$



Homework:

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and Graph:

a) $y = 2\sin(x + 30°) - 1$

b) $y = 3\cos\frac{1}{2}(x + 90°)$

c) $y = \sin\frac{5}{2}(x - 120°) + 2$

d) $y = 1.5\sin(3x - 270°) - 1$