Math 4 Pre-Calculus
Lecture 18 Part 1

Homework
pg. 570–572: 9–77eoo pg. 589: 5–15 odd

Transformations of Sine and Cosine — 7.6 and 7.8

Vertical Transformations

To compute both a vertical stretch/flip/shrink and a vertical shift on the same graph, FIRST stretch/flip/shrink, then shift.

Theorem on Amplitudes and Vertical Shifts

If $y = a\sin(x) + d$ or $y = a\cos(x) + d$ for any real numbers a and d $a \neq 0$, then the graph has an amplitude of $|a|$ and an "equilibrium" at the horizontal line $y = d$.

Amplitude animation: http://www.yenka.com/freecontent/item.action?quick=ot#
Vertical shifting animation: http://www.yenka.com/freecontent/item.action?quick=ji#

Horizontal Transformations

To "see" horizontal transformations, the argument must be in factored form. Once in factored form, to compute both a horizontal stretch/flip/shrink and a horizontal shift on the same graph, FIRST stretch/flip/shrink, then shift. Remember that horizontal transformations are "opposite" of what they seem. It's easiest to figure out the proper endpoints for one period. See below.

Theorem on Phase Shifts and Periods

If $y = \sin(bx + c)$ or $y = \cos(bx + c)$ for any real numbers b and c, $b \neq 0$, then

i) The period is $\frac{2\pi}{|b|}$ and the phase shift is $-\frac{c}{b}$.

ii) The interval containing exactly one cycle can be found by solving the inequality $0 \leq bx + c \leq 2\pi$.

Period Change Animation:
http://www.mathwarehouse.com/trigonometry/period-sine-cosine/how-equation-effects-graph.php

Phase Shift Animation (:
http://www.intmath.com/Trigonometric-graphs/3_Graphs-sin-cos-phase-shift.php

1. *Graph the equation.*
$y = 2\sin(x) + 1$

Normal Sine Wave:

Amplitude:

"Equilibrium" line:

Period:
Phase shift:
Period endpoints:

2. *Graph the equation.*

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

Normal Cosine Wave:

Amplitude:

"Equilibrium" line:

Period:
Phase shift:
Period endpoints:

3. *Graph the equation.*

$$y = -3\cos(x) - 2$$

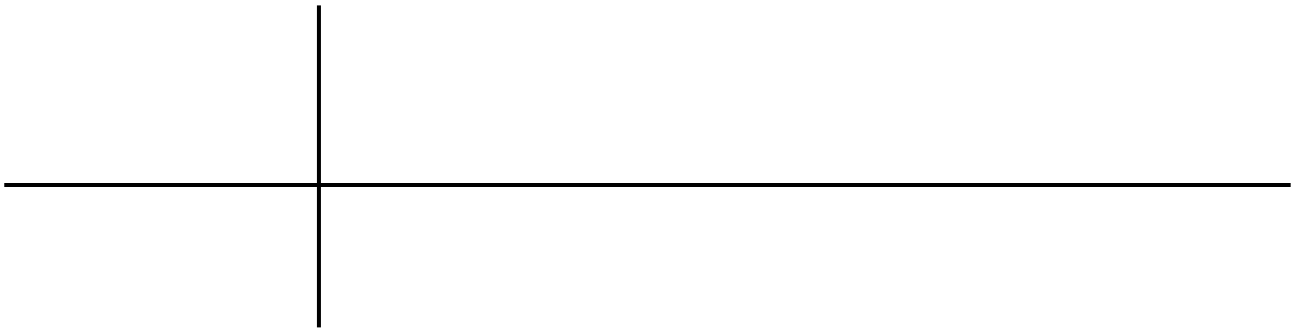
Normal Sine Wave:

Amplitude:
"Equilibrium" line:

Period:

Phase shift:

Period endpoints:



4. *Graph the equation.*

$$y = -4\cos\left(2x + \frac{\pi}{3}\right)$$

Normal Cosine Wave:

Amplitude:

"Equilibrium" line:

Period:

Phase shift:

Period endpoints: