Transformations of Sinusoidal Functions

These notes are intended as a summary of section 6.6 (p. 529 – 534) in your workbook. You should also read the section for more complete explanations and additional examples.

Recall

Sinusoidal functions have the form

$$y = a\sin b\left(x - c\right) + d \qquad \text{or} \qquad y = a\cos b\left(x - c\right) + d$$

The values of a, b, c, and d describe certain properties of the sinusoidal function, as described below:

Amplitude = $|a|$

Period = $\dfrac{2\pi}{b}$

Phase Shift = c

Equation of center line: $y = d$

The location of the zeros depends on several factors. It is even possible for a sinusoidal function to have no zeros.

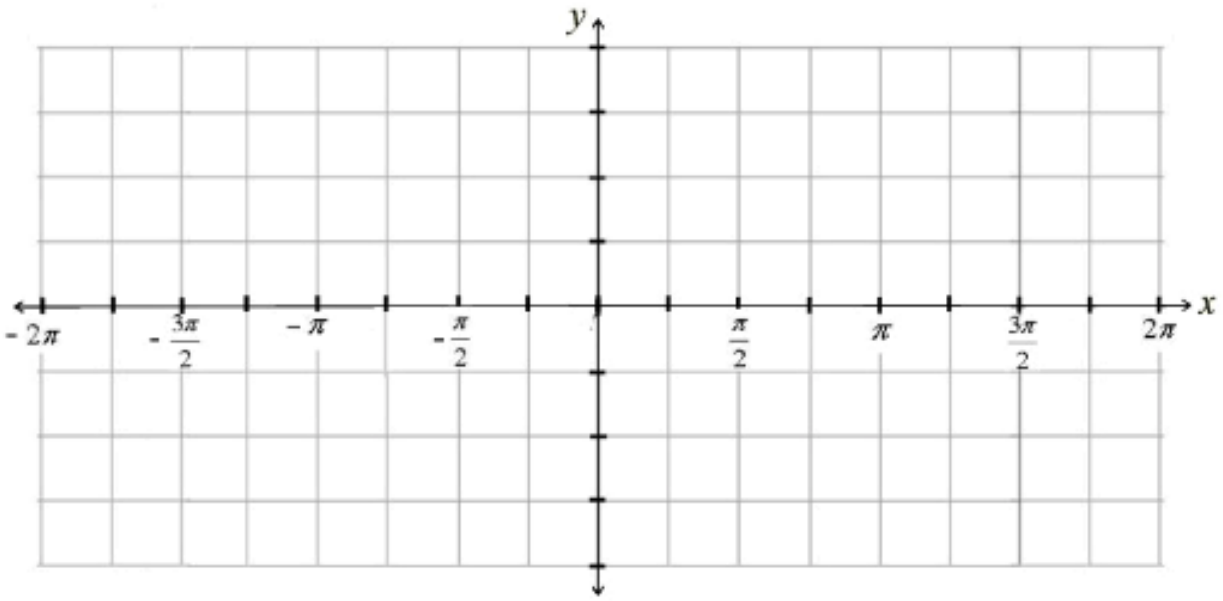
Graphing Sinusoidal Functions

In general, when graphing sinusoidal functions, use the following procedure:

1. Draw the center line (as a dotted line) at $y = d$.
2. Use the amplitude (a) and the center line to label the minimum and maximum.
3. Find the period of the function $\left(\dfrac{2\pi}{b}\right)$ and divide it into 4 equal sections.
4. Sketch the graph without a phase shift (as a dotted line).
5. Apply the phase shift and draw the final graph.

Example (not in workbook)

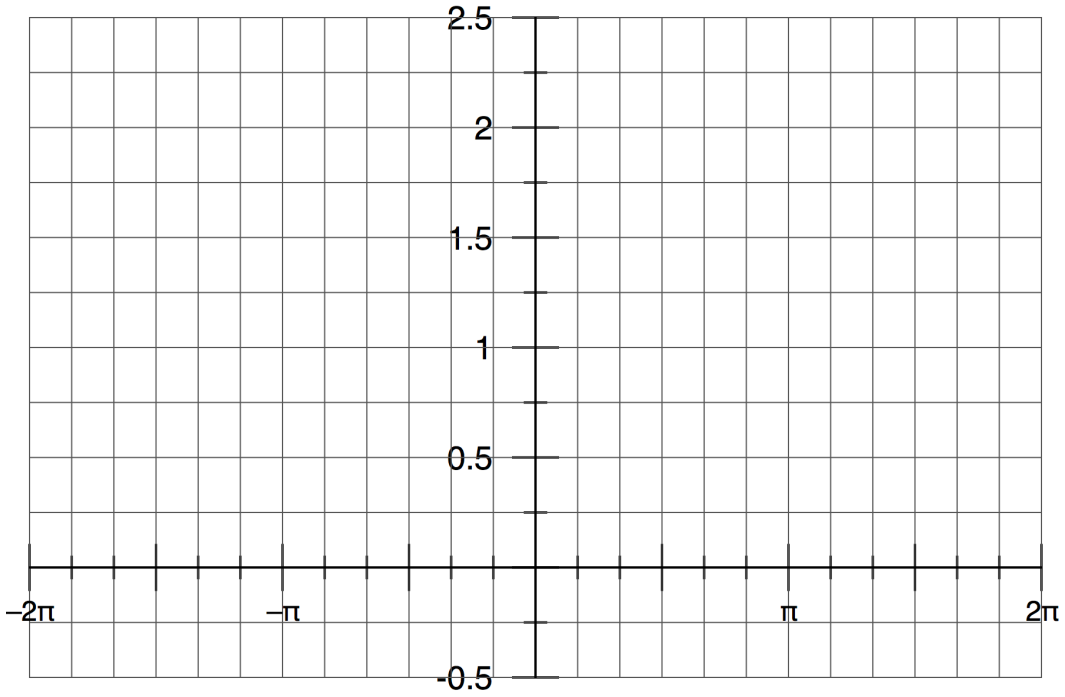
Sketch the graph of $y = 2\cos 2\left(x - \frac{\pi}{4}\right) - 2$ for $-2\pi \le x \le 2\pi$.



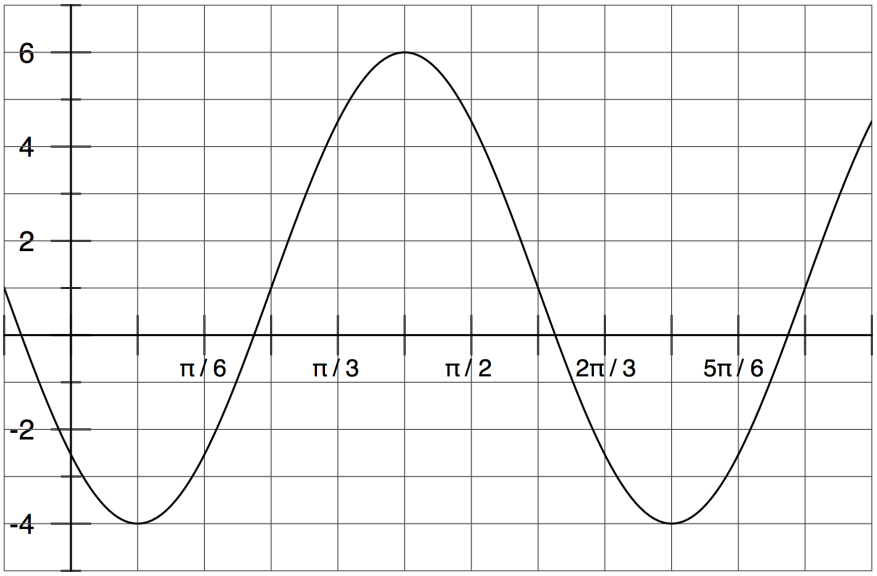
Example 1 (sidebar p. 532)

a) Predict how the graph of $y = \frac{1}{4}\cos 3\left(x + \frac{\pi}{6}\right) + 2$ is related to the graph of $y = \cos x$.

b) Sketch the graph of $y = \frac{1}{4}\cos 3\left(x + \frac{\pi}{6}\right) + 2$ for $-2\pi \le x \le 2\pi$, then list the characteristics of the function.



Example 2 (sidebar p. 533)
Write an equation for the sinusoidal function graphed below, in terms of $\sin x$.



Homework: #3 – 11 in the exercises (p. 534 – 540). Answers on p. 540.