A NEW TWIST ON TRIGONOMETRIC GRAPHS

AMATYC
34th Annual Conference
Washington, DC

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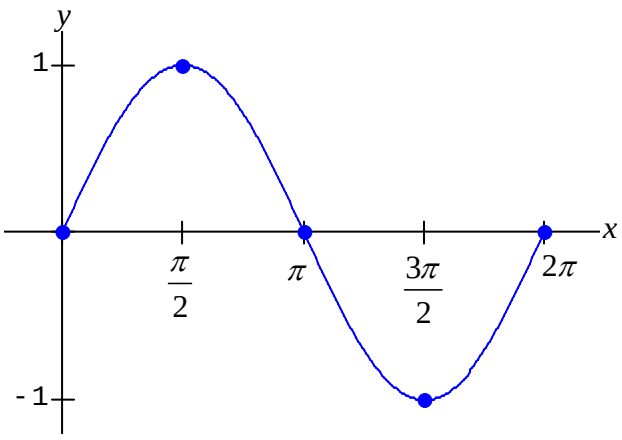
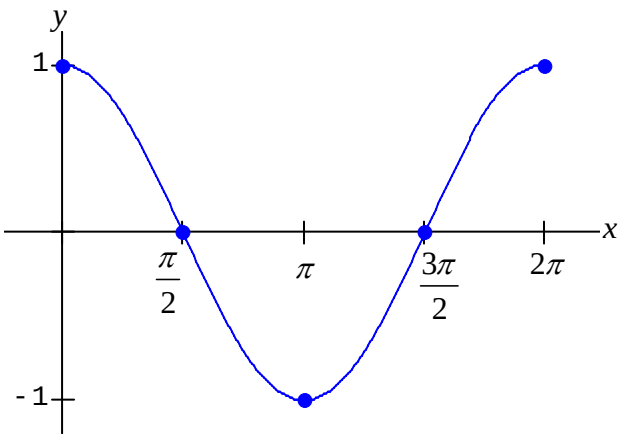
THE SIX BASIC CYCLES

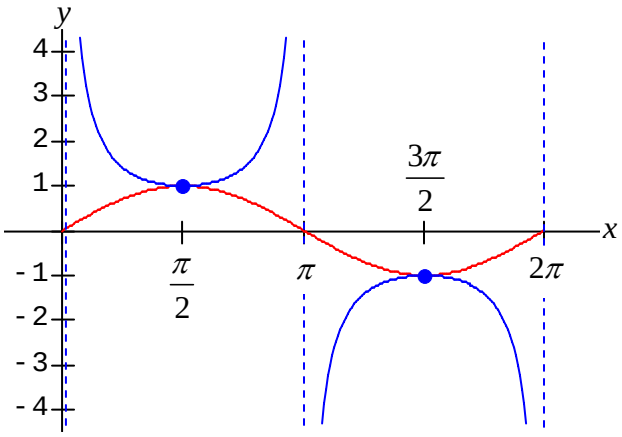
$y = \sin x$



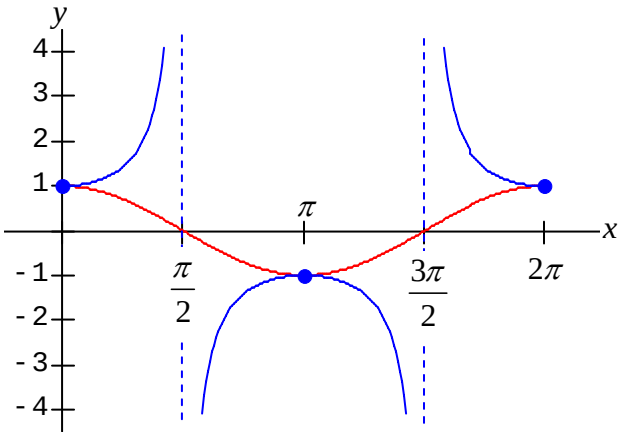
$y = \cos x$



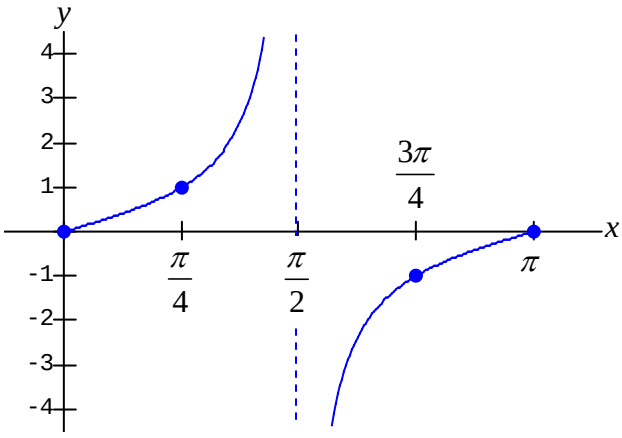
$y = \csc x$



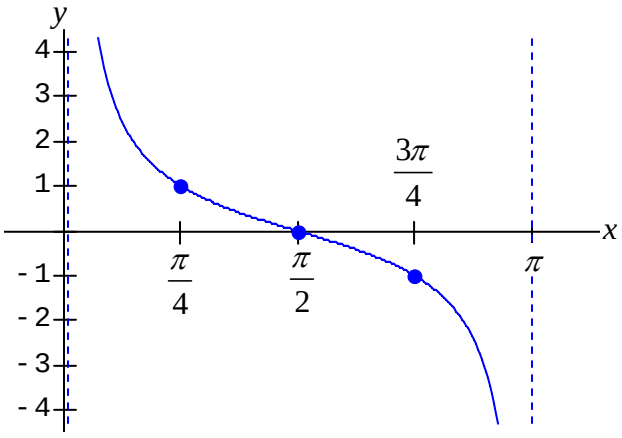
$y = \sec x$



$y = \tan x$



$y = \cot x$



STEP-BY-STEP PROCESS

1. Find the vertical translation and draw a horizontal line (lightly) at this value. Pretend this is now the *x*-axis.

2. Find the amplitude *A*. Lightly draw horizontal lines *A* units above and below the translated *x*-axis. This gives us the upper and lower sides of the frame.

3. Solve the compound inequality $0 \le \text{argument} \le 2\pi$ (or $0 \le \text{argument} \le \pi$) for the variable *x*. After *x* is isolated:
   - the left value is the phase shift, and indicates where a cycle begins
   - the right value indicates where a cycle ends
   - the difference of the two values is the period

4. Find the period and divide it by four. Set the scale on your *x*-axis so that this value is associated with some whole number multiple of squares on the graph paper (like two squares, for instance).

5. Lightly draw vertical lines where the cycle begins and ends. These lines form the left and right sides of the frame.

6. Subdivide the frame (lengthwise) into four equal sections. To label the three intermediary points, start at the left edge of the frame and add one-fourth the period in succession three times.

7. Plot the anchor points and sketch any asymptotes. Don't forget to check for a reflection and adjust the anchor points accordingly.

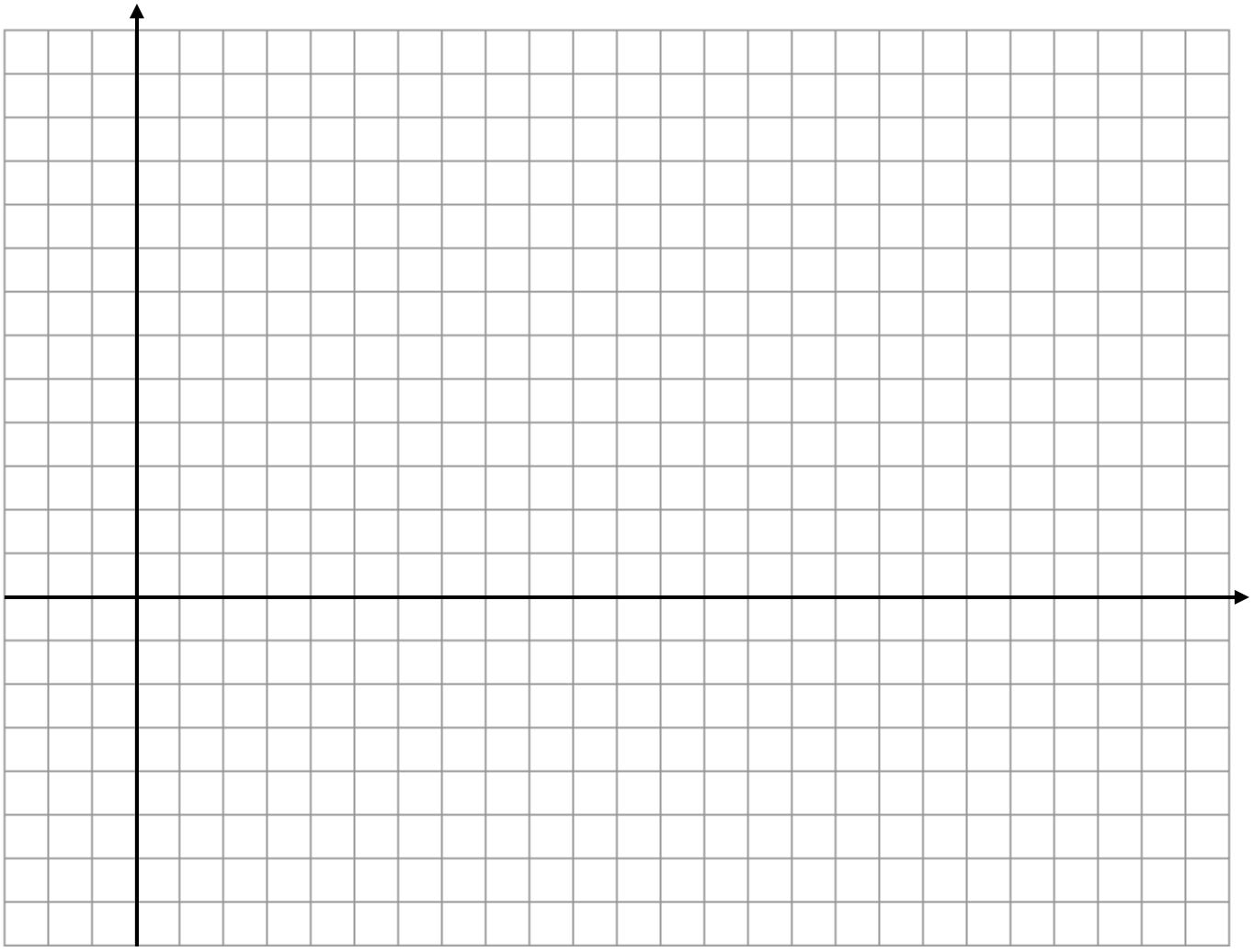
8. Within the frame, sketch the graph of a complete cycle through the anchor points.

9. Extend the graph by duplicating the cycle as necessary.

10. To verify on a graphing calculator, use the frame to help set up an appropriate window.

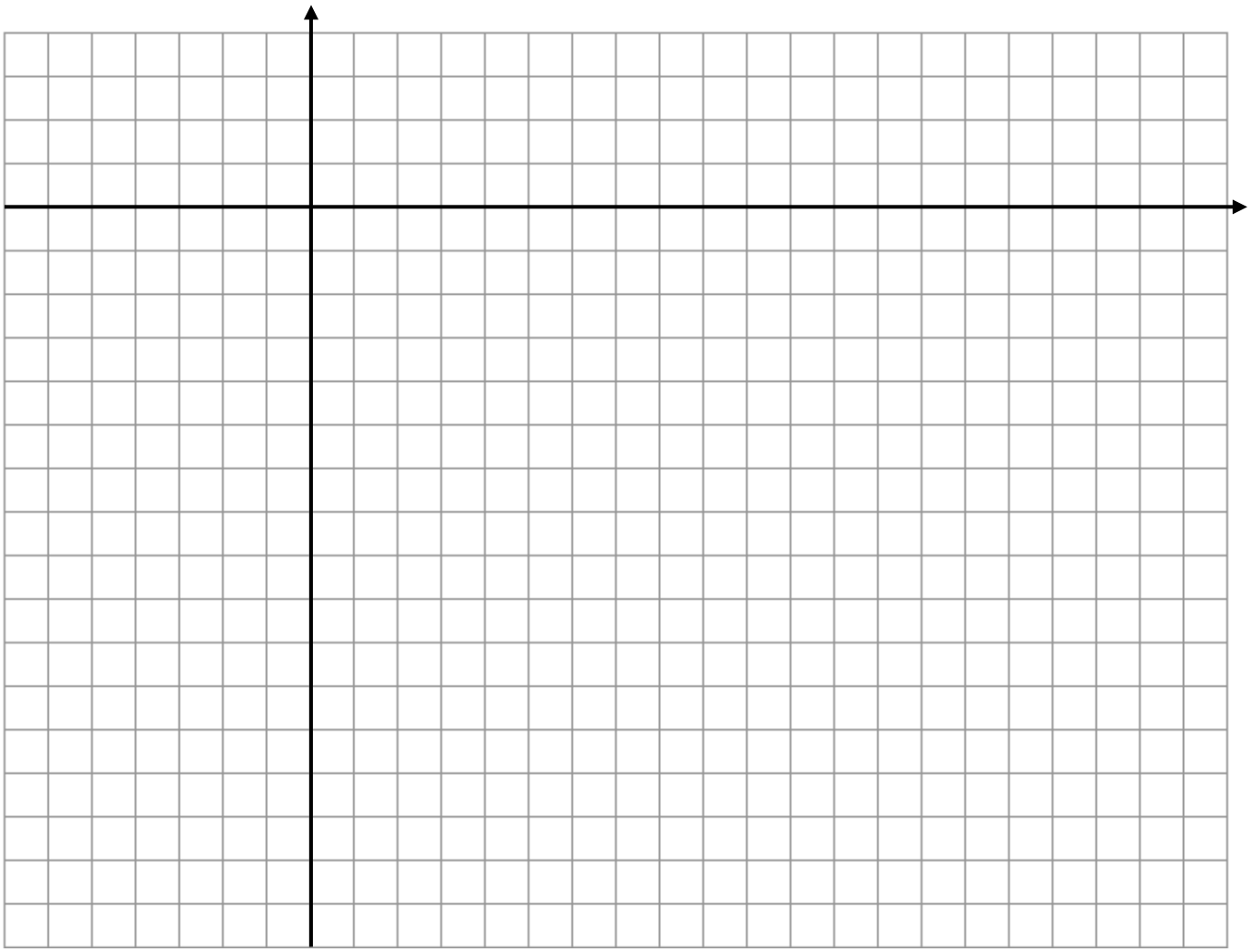
EXAMPLES

1. Graph $f(x) = 2 - 3\cos(4x - \pi)$



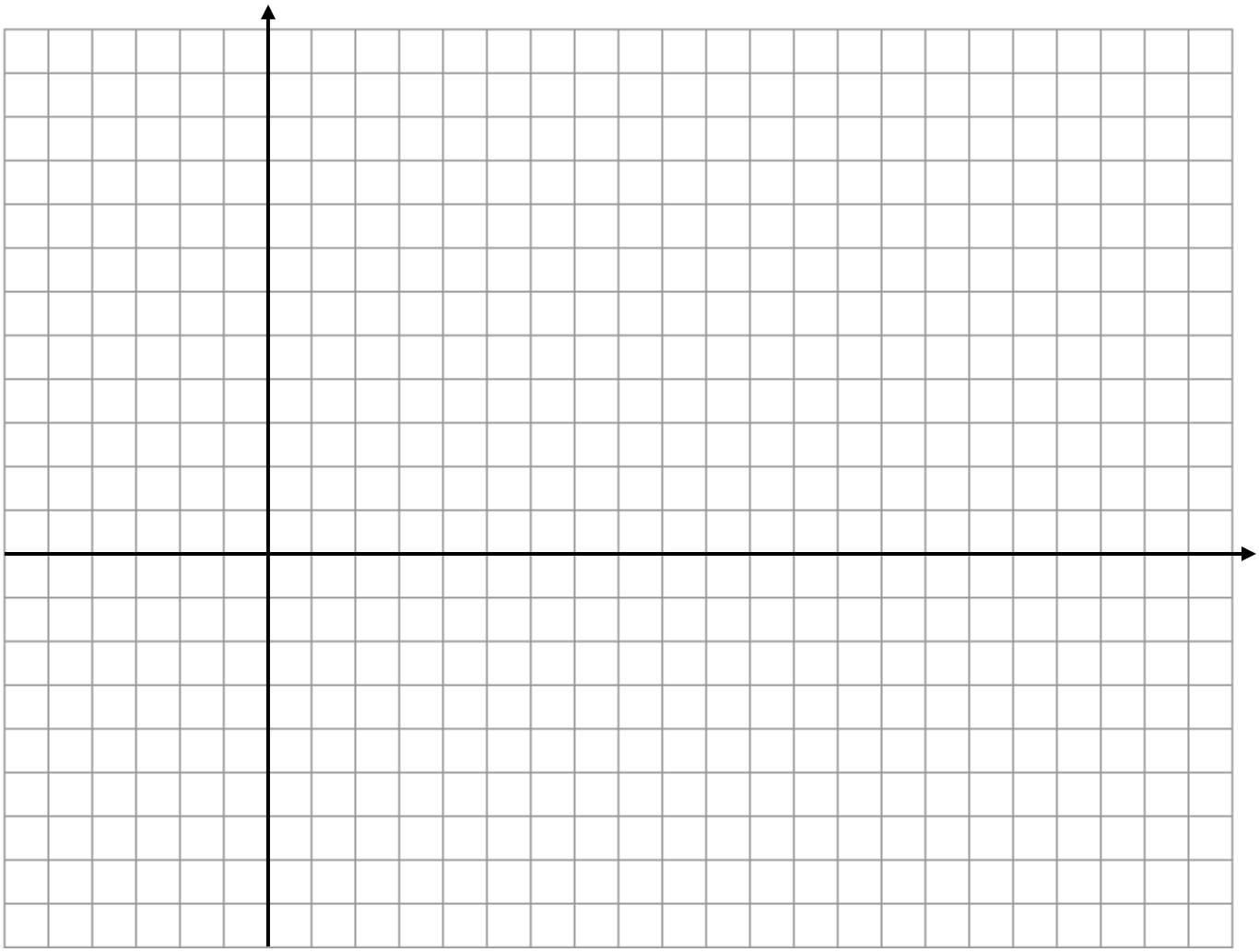
EXAMPLES

2. Graph $f(x) = \frac{1}{2}\tan\left(\pi x + \frac{\pi}{4}\right) - 3$



EXAMPLES

3. Graph $f(x) = 1 - 2\csc\left(\frac{x}{2} + \frac{\pi}{3}\right)$



LINKS

GeoGebra

http://www.geogebra.org

GeoGebra Applets

http://academic.cuesta.edu/mturner/applets/index.htm

Java Runtime Environment

http://www.java.com/en/download/manual.jsp

This PowerPoint presentation and the handout are available on my web site at:

http://academic.cuesta.edu/mturner/speak.htm