MATH 135 – Calculus 1
Practice on Trigonometric Functions
September 9, 2019

Background

In the video and class today, we have seen a "lightning review" of trigonometry. To practice on some ideas related to this, do the following problems.

Questions

1) Sinusoids

   (a) Starting from the graph $y = \sin(x)$ and using scaling and shifting, sketch the graph $y = 3\sin\left(\frac{x}{2}\right) - 1$ on the interval $[0, 8\pi]$. (*Do not use a graphing calculator to generate your plot.* You may check your work after you are finished, but try to do this by hand.)

   (b) The graph in part (1) is an example of a *sinusoid* (or sine-wave graph). The *amplitude* of a sinusoid is one-half the vertical distance between the minimum and maximum values. What is the amplitude of your sinusoid in part (a)?

   (c) The *period* of a sinusoid $f(x)$ is the *smallest strictly positive number* T for which it is true that $f(x+T) = f(x)$ for all x. For example the period of $f(x) = \cos(x)$ is $T = 2\pi$. What is the period of the sinusoid from part (a)?

   (d) Give a formula defining a sinusoidal graph $y = f(x)$ with amplitude $A = 7$ and period $T = 5\pi$, whose value at $x = 0$ is $f(x) = 0$.

2) *By hand* (not using a graphing calculator) sketch the portion of the graph $y = \cot(x) = \frac{\cos(x)}{\sin(x)}$ for $0 < x < \pi$, as follows:

   (a) First, determine where the vertical asymptotes are located and sketch the four closest to $x = 0$.

   (b) Next, mark the points on the intervals between your asymptotes where $\cot(x) = 0$.

   (c) Starting from $x = 0$, is $\cot(x)$ *increasing or decreasing*?

   (d) Put everything together to sketch your graph.

3) How are $\tan\left(x - \frac{\pi}{2}\right)$ and $\cot(x)$ related?