

Calculator Project  
22M:005  
Due Monday, March 20  
20 points possible

**Instructions:** Complete each of the following exercises and answer all questions (unless otherwise specified). For problems that ask you to do something with your calculator, your answers should include either a description of the process you used or the exact keystrokes you used to get your solution. Questions asking for a description or explanation should be answered in complete sentences.

**Presentation:** This project should be turned in on college ruled loose-leaf paper. You may write on both sides of the paper, but each question should start on a fresh side. The final project should be written clearly and legibly. Any project not meeting these criteria may be penalized up to 5 points.

1. Verify the following trigonometric identities by hand, and then use your graphing calculator to verify them. (Hint: graph one side of the identity using a heavier line weight so you can tell the two graphs apart.)

a.  $\sin 4x = 4 \sin x \cos x \cos 2x$

b.  $\sin x + \cos x = \frac{\sin x}{1 - \frac{\cos x}{\sin x}} + \frac{\cos x}{1 - \frac{\sin x}{\cos x}}$

c.  $\frac{1 + \cos x}{1 - \cos x} - \frac{1 - \cos x}{1 + \cos x} = 4 \cot x \csc x$

2. Consider the following “identity”.

$$\sin x + \cos x = 1 + x - \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{24} + \frac{x^5}{120} - \frac{x^6}{720}$$

Using a graphing window of

$$x_{\min} = -\frac{5\pi}{8} \quad x_{\max} = \frac{3\pi}{4} \quad y_{\min} = -2 \quad y_{\max} = 2$$

graph each side of the “equation”. How close are the graphs? Now graph both sides using a graphing window of

$$x_{\min} = -2\pi \quad x_{\max} = 2\pi \quad y_{\min} = -2 \quad y_{\max} = 2.$$

What happens? Is this an identity?

3. Solve each of the following trigonometric equations by hand over the interval  $[0, 360^\circ)$ . Then use the Solver feature of your graphing calculator to verify your solutions. In what format does your calculator display the solutions?
- $\sin 3x = 0$
  - $2 \sin \theta = 2 \cos 2\theta$
  - $4 \cos 2\theta = 8 \sin \theta \cos \theta$
4. Use your calculator to graph each of the following functions over an appropriate interval. For each function, you should turn in a sketch of the graph, a description of how you entered the function into your calculator, and an explanation (if necessary) of why your calculator may not have graphed the function appropriately.
- $f(x) = \sec(2x)$
  - $g(x) = \tan^{-1}(\tan(x))$
  - $f(x) = \cot^{-1}(x)$