

Calculator Project 2  
30 points possible  
Due Monday, November 6

To complete this assignment you will need a graphing calculator—preferably a TI model. Each part of this assignment focuses on a certain aspect of calculator-aided mathematics. Some parts may take very little effort, while others may be more challenging. Your final solutions should be neatly written on loose-leaf paper and must be stapled together. Questions asking for a description or explanation should be answered in complete sentences. Projects will be graded based on correctness, completeness, and on presentation.

1. Verify the following trigonometric identities by hand, and then use your graphing calculator to verify them. (Suggestion: 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 (if necessary) of why your calculator may not have graphed the function appropriately.
- $f(x) = \sec(2x)$
  - $g(x) = \tan^{-1}(\tan(x))$
  - $f(x) = \cot^{-1}(x)$
5. The following table contains hourly temperatures recorded in Iowa City one day last April. Use your calculator to create a list-plot of this data. What shape does the data have? Have your calculator do a sinusoidal regression on this data. What is the equation your calculator gives you?

Time	Temp	Time	Temp
12:00 am	<b>51°F</b>	12:00 pm	<b>67°F</b>
1:00	<b>47°F</b>	1:00	<b>69°F</b>
2:00	<b>42°F</b>	2:00	<b>70°F</b>
3:00	<b>42°F</b>	3:00	<b>72°F</b>
4:00	<b>45°F</b>	4:00	<b>72°F</b>
5:00	<b>44°F</b>	5:00	<b>71°F</b>
6:00	<b>40°F</b>	6:00	<b>69°F</b>
7:00	<b>47°F</b>	7:00	<b>65°F</b>
8:00	<b>52°F</b>	8:00	<b>56°F</b>
9:00	<b>56°F</b>	9:00	<b>53°F</b>
10:00	<b>60°F</b>	10:00	<b>51°F</b>
11:00	<b>65°F</b>	11:00	<b>48°F</b>