LARSON—MATH 255–CLASSROOM WORKSHEET 04
Plotting, Solving, Calculus.

1. Create a Cocalc/Sage Cloud account.

   (a) Start the Chrome browser.

   (b) Go to `http://cocalc.com`

   (c) "Create new account" using **your VCU email address** .

   (d) You should see an existing Project for our class. Click on that.

   (e) Click "New", then "Sage Worksheet", then call it **c04**.

   (f) For each problem number, label it in theSAGE cell where the work is. So for Problem 1, the first line of the cell should be `#Problem 1`.

   Review

   - The multiplication operator in SAGE is "*". The most common error in SAGE is forgetting to put in a "*" when multiplying.
   - produces *exact* answers. You often have to *force* SAGE to give you a decimal approximation of what you've calculated.
   - log in SAGE is the *natural log* (it *is* possible to compute logs in *any* base though).
   - Angles in SAGE are assumed to be in radians (angles in degrees must be converted to radian measure).
   - `plot` is SAGE's powerful and flexible command for plotting functions of a single variable.

2. Sketch $\cos x$ on the interval $(-2\pi, 2\pi)$.

3. Sketch $\tan x$ with x-range between $x = -\pi$ and $x = \pi$, and y-range between $y = -6$ and $y = 6$.

4. Find $\sin \frac{2\pi}{3}$ to 30 digits of precision. (You may have to look back at your old worksheets or code. That will be common until your skills become locked-in).

   New

5. Solve $x^2 - 1 = 0$ by evaluating `solve(x**2-1,x)`.

6. Solve $x^2 + 1 = 0$.

7. Solve $x^2 + x = 25$.

8. Find all solutions of $\sin\theta = \frac{1}{2}$ by hand. Now evaluate `solve(sin(x)-.5,x)`. Explain SAGE's result.

9. Define variables a, b and c. One way to do this is with the command `var("a b c")`. Solve $ax^2 + bx + c = 0$ by evaluating `solve(a*x**2+b*x+c, x)`.

10. Draw the graphs of the following equations by hand. Find the solutions by hand.

$$\begin{cases} x^2 + y^2 = 4 \\ y = x + 1 \end{cases}$$

Now use `solve()` to find the intersection points of the graphs of this system of equations. First use the Help by typing `help(solve)`.

11. Consider the following system. Sketch the graphs of these lines on the same coordinate system (by hand and then with `plot`), then `solve` to get the exact point of intersection. $\begin{cases} 2x + y = 20 \\ -x + y = 0 \end{cases}$

12. Consider the following system. Sketch the graphs of these equations on the same coordinate system (by hand and then with `plot`), then `solve` to get the exact points of intersection. $\begin{cases} y = x^2 \\ y = x \end{cases}$

13. Type in the following program and evaluate. (Note that there are *exactly* four spaces before the word "print").

```
def write_string(string_name):
    print(string_name)
```

Now type `write_string("hello world!")` and evaluate.

In order to do sophisticated calculations, or to allow for multiple inputs, you will need to write *programs*. Our "hello world!" program was the first example. It included a `print` statement. Other program features, in almost any language, include *conditional statements* (if..then..) and *loops*.

14. Type in the following function definition and evaluate.

```
def absolute(x):
    if x>=0:
        return x
    else:
        return -x
```

Getting your classwork recorded

When you are done, before you leave class...

(a) Click the "Make pdf" (Adobe symbol) icon and make a pdf of this worksheet. (If CoCalc hangs, click the printer icon, then "Open", then print or make a pdf using your browser).

(b) Send me an email with an informative header like "Math 255 - c04 worksheet attached" (so that it will be properly recorded).