

Last name \_\_\_\_\_

First name \_\_\_\_\_

**LARSON—MATH 353—CLASSROOM WORKSHEET 04**  
**Getting Started.**

1. Log in to CoCalc.
  - (a) Start the Chrome browser.
  - (b) Go to <https://cocalc.com>
  - (c) Login (**your VCU email address** is probably your username).
  - (d) You should see an existing Project for our class. Click on that.
  - (e) Click “New”, then “Worksheets”, then call it **c04**.
  
2. **A problem to think about: the Birthday Problem.** If there’s 366 students in a room some pair of them are guaranteed to have the same birthday (month & day) . If there are only 2 students in a room they are very unlikely to have the same birthday. How many students do we need in order for the probability to be at least  $\frac{1}{2}$  that at least one pair of students has the same birthday?
  
3. Use `plot()` to sketch one period of  $\cos x$ .
  
4. Sketch  $x^2$  and  $x^3$  on the interval  $(-2, 2)$ .
  
5. Use Help on the `plot()` function to learn how to add color to a graph sketch (type and evaluate `plot?`).
  
6. Sketch  $x^2$  and  $x^3$  on the interval  $(-2, 2)$ . Make one graph red and the other graph green.
  
7. Evaluate  $f(x) = x^3 - x$ . Find  $f(1)$ ,  $f(100)$ . Try `plot(f,-2,2)` and `plot(f(x),-2,2)` and `plot(f)`.
  
8. Evaluate  $c = \frac{27}{14}$ . Find  $f(c)$ .
  
9. Define a new variable “y” by evaluating `var("y")`. Now sketch  $g(x) = x^2 + y^2 - 2$  for  $-1 \leq x \leq 1$  and  $-1 \leq y \leq 1$  by evaluating `plot3d(x**2+y**2-2, (-1,1), (-1,1))`.

10. Solve  $x^2 - 1 = 0$  by evaluating `solve(x**2-1,x)`
11. Find all solutions of  $\sin \theta = \frac{1}{2}$  by hand. Now try `solve(sin(x)-.5,x)`. Explain Sage's result.
12. 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)`.
13. Consider the system:  $\begin{cases} 2x + y = 20 \\ -x + y = 0 \end{cases}$
- Sketch the graphs of these lines on the same coordinate system, then solve to get the exact point of intersection.
14. Sketch the graph of  $f(x) = x^5 + x^4 + x^3 - x^2 + x - 1$ . Find the root (zero) of this function: `find_root(x^5 + x^4 + x^3 - x^2 + x - 1, -1, 1)`. Now try `find_root(x^5 + x^4 + x^3 - x^2 + x - 1, -1, 0)`. Explain the result.
15. Type in the following program and evaluate.

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

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

### Getting your classwork recorded

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

- 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).
- Send me an email with an informative header like “Math 353—c04 worksheet attached” (so that it will be properly recorded).
- Remember to attach today's classroom worksheet!