Last name _____

First name _____

LARSON—MATH 255–CLASSROOM WORKSHEET 02
Getting Started.

1. Log in to your Cocalc account.
   (a) Start the Chrome browser.
   (b) Go to `http://cocalc.com`
   (c) You should see an existing Project for our class. Click on that.
   (d) Click "New", then "Sage Worksheets"; call it **c02**.
   (e) For each problem number, label it in the Sage cell where the work is. So for Problem 1, the first line of the cell should be `#Problem 1`.
2. Find (evaluate, RUN) $623 * 937$.
3. Find 3^{17} by evaluating `3**17`.
4. Evaluate "pi". Use $n(\_)$ to find a decimal approximation for π.
5. Get Help with the numerical approximation function `n()` by typing `n?`. Use `n()` with an added parameter to find a 30-digit approximation for π.
6. Find $\sin(47°)$ to 10 digits of precision; evaluate `sin(47 * (pi/180))` to get an *exact* expression. Evaluate `n(sin(47 * (pi/180)), digits=10)` to get an *approximation*.
7. Get Help with the Square Root command by typing "sqrt?".
8. Sketch one period of $\cos x$ by evaluating `plot(cos(x),(0,2*pi))`
9. What command would you run to sketch x^2 on the interval $(-2, 2)$. How about x^3 ?
10. Use Help on the `plot()` function to learn how to add color to a graph sketch (type and evaluate `plot?`).
11. Sketch x^2 and x^3 on the interval $(-2, 2)$. Make one graph red and the other graph green.
12. Define a function $f(x) = x^3 - x$ by evaluating `f(x)=x**3-x`. Then find $f(1)$, $f(100)$. Evaluate `plot(f,-2,2)` and `plot(f(x),-2,2)` and `plot(f)`.

13. Define a constant $c = \frac{27}{14}$ by evaluating `c=27/14`. Find f(c).

14. Define a new variable "y" by evaluating `var("y")`. Now sketch $g(x, y) = x^2 + y^2 - 2$ for $-1 \leq x \leq 1$ and $-1 \leq y \leq 1$ by evaluating `g(x,y)=x**2+y**2-2` and then `plot3d(g(x,y), (x,-1,1),(y,-1,1))`.

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

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

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

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

19. 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)`

20. 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 `solve?`.

21. 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.

22. Consider the system: $\begin{cases} y = x^2 \\ y = x \end{cases}$

Sketch the graphs of these equations on the same coordinate system, then solve to get the exact points of intersection.

23. Sketch the graph of $f(x) = x^5 + x^4 + x^3 - x^2 + x - 1$ (using `plot`). Find the root (zero) of this function by evaluating `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)`. Can you explain the result?