**Last name** _____

**First name** _____

**LARSON—MATH 255–HOMEWORK WORKSHEET h05**
**Test 1 Review.**

1. Log in to your Sage/Cocalc account.
   (a) Start the Chrome browser.
   (b) Go to `http://cocalc.com` and sign in.
   (c) You should see an existing Project for our class. Click on that.
   (d) Click "New", call it **h05**, then click "Sage Worksheet".
   (e) For each problem number, label it in the Sage cell where the work is. So for Problem 2, the first line of the cell should be `#Problem 2`.

   **Run all your code to make sure that it works.**
2. Find $635 \cdot 629$.
3. What command would you write to test whether a number $x$ equals 0?
4. What command would you write to find the remainder of dividing an integer $x$ by 2?
5. What command would you write to find a 20-digit approximation for $\pi$.
6. What command would you write to find $\sqrt[3]{47}$.
7. What command would you write to find $\log_{10} 47$?
8. What command would you write to find sketch $x^3 - x$ on the interval $(-3, 3)$.
9. What command would you write to plot $\sin(x)$ and $\cos(x)$ on $(-2\pi, 2\pi)$ on the same axes. Make them purple and green.
10. What command would you write to solve $x^2 - x = 25$.
11. What command would you write to solve the system. $\begin{cases} 2x + y = 5 \\ x + 3y = 7 \end{cases}$
12. Find the root of $f(x) = x^5 + x^4 + x^3 - x^2 + x - 1$ that's in the interval (-1,1).
13. What command would you write to make a triangle with a red dotted line.
14. What command would you write to find the first and second derivatives for $f(x) = x^x$. Solve $f'(x) = 0$.
15. Find a numerical approximation for $\int_2^3 t^{20} e^t \, dt$.
16. What command would you write to find $\lim_{x \to 0} \dfrac{\sin x}{x}$.

17. What command would you write to find the row-reduced echelon form of the matrix $A = \begin{bmatrix} 2 & 1 & 5 \\ 1 & 3 & 7 \end{bmatrix}$.

18. What command would you write to define a list L of integers from 2 to 55.

19. What command would you write to define a list L2 which contains the integers from 2 to 55 followed by the integers from 100 to 123.

20. What command would you write to define a list L3 which contains 50 zeros.

21. Define a function `square_list(L)` which inputs a list $L$ of numbers and returns a list of the squares of those numbers.

22. Define a function `three_mult(n)` which tests if an integer n is a multiple of three, returns True if it is and False if it is not.

23. Define a function `list_evens(n)` that returns a list of all the even numbers up to n.

24. Define a function `count_evens(L)` that inputs a list $L$ of integers and returns a count of how many of them are even.

25. What is a *recursive function*?

26. Define a recursive function `test_rec(n)`
with `test_rec(1)=5` and `test_rec(n)=test_rec(n-1)+17` if $n > 1$. Find `test_rec(10)`.

27. Define a function `collatz(x)` that returns x if x is one, returns collatz(3x+1) if x is odd, and returns collatz(x/2) if x is even.

28. Given a continuous function $f(x)$, and numbers $a$, $b$ and $c$, define a function `test_average(f,a,b,c)` that returns the tuple $(a, (a+b)/2)$ if $f((a+b)/2) \geq c$ and returns $((a+b)/2, b)$ if $f((a+b)/2) < c$.

29. If $L$ is a list of integers, what command would you give to get a scatter plot that visualizes this data? What you write should work for any list $L$, but test it with `L=[2,3,5,7,11]`.

30. Define a function `randlist(n)` which returns a list of n random numbers in [0,1].

**New Problem**

31. If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23. Write a program to find the sum of all the multiples of 3 or 5 below 1000.

32. **When you are done** click "convert to pdf". **Send me the pdf** at `clarson@vcu.ecu` with the header "Math 255 Test 1 Review attached". It is due **before** the test starts.

    You are now ready for the test. You can refer to your work during the test. I recommend making comments and annotating your `h05` worksheet. Your hard work *will* pay off!