

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

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

**LARSON—MATH 255—HOMEWORK WORKSHEET h01**  
**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 **h01**, then click “Sage Worksheet”.
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  $x^2$  and  $x^3$  on the interval  $(-2, 2)$ , using different colors?
10. 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.
11. What command would you write to solve  $x^2 - x = 25$ .
12. What command would you write to solve the system. 
$$\begin{cases} 2x + y = 5 \\ x + 3y = 7 \end{cases}$$
13. Find the root of  $f(x) = x^5 + x^4 + x^3 - x^2 + x - 1$  that's in the interval  $(-1, 1)$ .
14. What command would you write to make a triangle with a red dotted line.
15. What command would you write to find the first and second derivatives for  $f(x) = x^x$ . Solve  $f'(x) = 0$ .
16. Find a numerical approximation for  $\int_2^3 t^{20} e^t dt$ .
17. What command would you write to find  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ .
18. What command would you write to find the row-reduced echelon form of the matrix 
$$A = \begin{bmatrix} 2 & 1 & 5 \\ 1 & 3 & 7 \end{bmatrix}.$$

19. What command gives you the entry of matrix  $A$  in the 2nd row and 3rd column?
20. What command would you write to define a list  $L$  of integers from 2 to 55.
21. 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.
22. What command would you write to define a list  $L3$  which contains 50 zeros.
23. Define an *anonymous function* (that is, using a *lambda* construction) `product` which returns the product of 2 numbers (so `product(x,y)=x*y`).
24. Define a function `square_list(L)` which inputs a list  $L$  of numbers and returns a list of the squares of those numbers.
25. 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.
26. Define a function `list_evens(n)` that returns a list of all the even numbers up to  $n$ .
27. Define a function `count_evens(L)` that inputs a list  $L$  of integers and counts how many of them are even.
28. What is a *recursive function*?
29. 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)`.
30. The Fibonacci sequence  $F_n$  is defined as follows  $F_0 = 0$ ,  $F_1 = 1$  and  $F_n = F_{n-1} + F_{n-2}$  for  $n > 1$ . Define an iterative (non-recursive) function `fib(n)` that computes  $F_n$  for a given input integer  $n$ .
31. 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  $f((a+b)/2) < c$ .
32. Define a function `rightpoint_riemann(f,a,b,n)` which computes the rightpoint Riemann sums for  $n$  equal intervals.
33. 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  $L=[2,3,5,7,11]$ .
34. Define a function `randlist(n)` which returns a list of  $n$  random numbers in  $[0,1]$  sorted from smallest to largest.
35. **When you are done** click “convert to pdf”. **Send me the pdf** at `clarson@vcu.edu` 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 h01 worksheet. Your hard work *will* pay off!