

## LARSON—MATH 255—CLASSROOM WORKSHEET 42

### Test 2 Review

- Start the Chrome browser.
  - Go to `http://cocalc.com`
  - Login using **your VCU email address** .
  - Click on our class Project.
  - Click “New”, then “Worksheets”, then call it **c42**.
  - 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**.

### Random Walks Interact

- The following Sage INTERACT starts with the origin  $(0,0,0)$  and “walks”  $u$  ( $u \in (-0.5, 0.5)$ ) units in each of the  $x$ ,  $y$  and  $z$  directions, repeats this up to 1,000 times, keeps track of all of the points that are visited and then draws all of the points, with lines from one point to the next.

```
@interact
def rwalk3d(n=slider(50,1000,step_size=1), frame=True):
    pnt = [0,0,0]
    v = [copy(pnt)]
    for i in range(n):
        pnt[0] += random()-0.5
        pnt[1] += random()-0.5
        pnt[2] += random()-0.5
        v.append(copy(pnt))
    show(line3d(v,color="black"),aspect_ratio=[1,1,1],frame=frame)
```

- Make a Sage INTERACT which simulates a random walk in the  $x$ - $y$  plane, starting at the origin.

### Review

- Write a program to find the *set* of positive integers less than 100 that are multiples of 3 or 5.
- Define a function `constant_matrix(n,m,c)` which takes positive integers  $n$ ,  $m$  and  $c$  as input and returns a  $n$  by  $m$  matrix whose entries are all  $c$ .
- Let  $L$  be a list with 300 (random) entries. What would you write to get the *slice* of  $L$  consisting of the first ten elements of  $L$ ?

7. Define a function `prime_sum(n)` which takes an integer  $n$  as input and returns the sum of the prime numbers up to  $n$ .
8. Create a  $3 \times 3$  identity matrix  $M$ . *Then* change the upper right corner entry to be 5.
9. Write a program to find all triples  $(a,b,c)$  with positive integers  $a,b,c \leq 10$  where  $a^2 + b^2 = c^2$ .
10. Use `list comprehension` to produce the cubes of the numbers in the list  $L = [3, 7, 2, 5]$ .
11. Define a function `random_average(n)` to choose  $n$  random integers between 1 and 100 and find the average of these  $n$  numbers. Find `random_average(n)` for  $n = 10$  to  $n = 1000$ . Use `scatter_plot` to display the results.
12. 12 has 6 factors: 1, 2, 3, 4, 6, 12. Find the positive integer no more than 100 with the most factors.

### 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 - c42 worksheet attached” (so that it will be properly recorded).
- (c) Remember to attach today’s classroom worksheet!