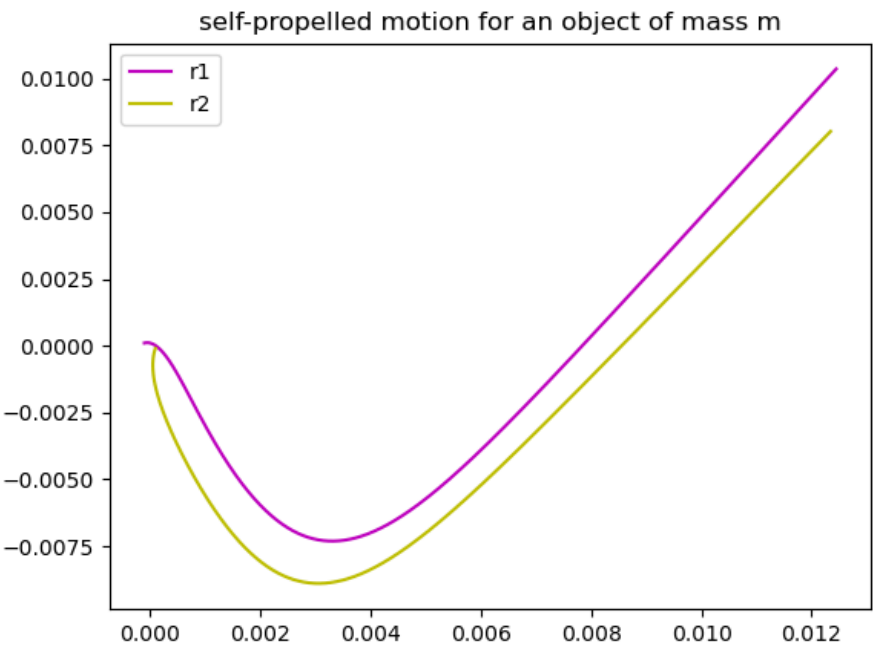
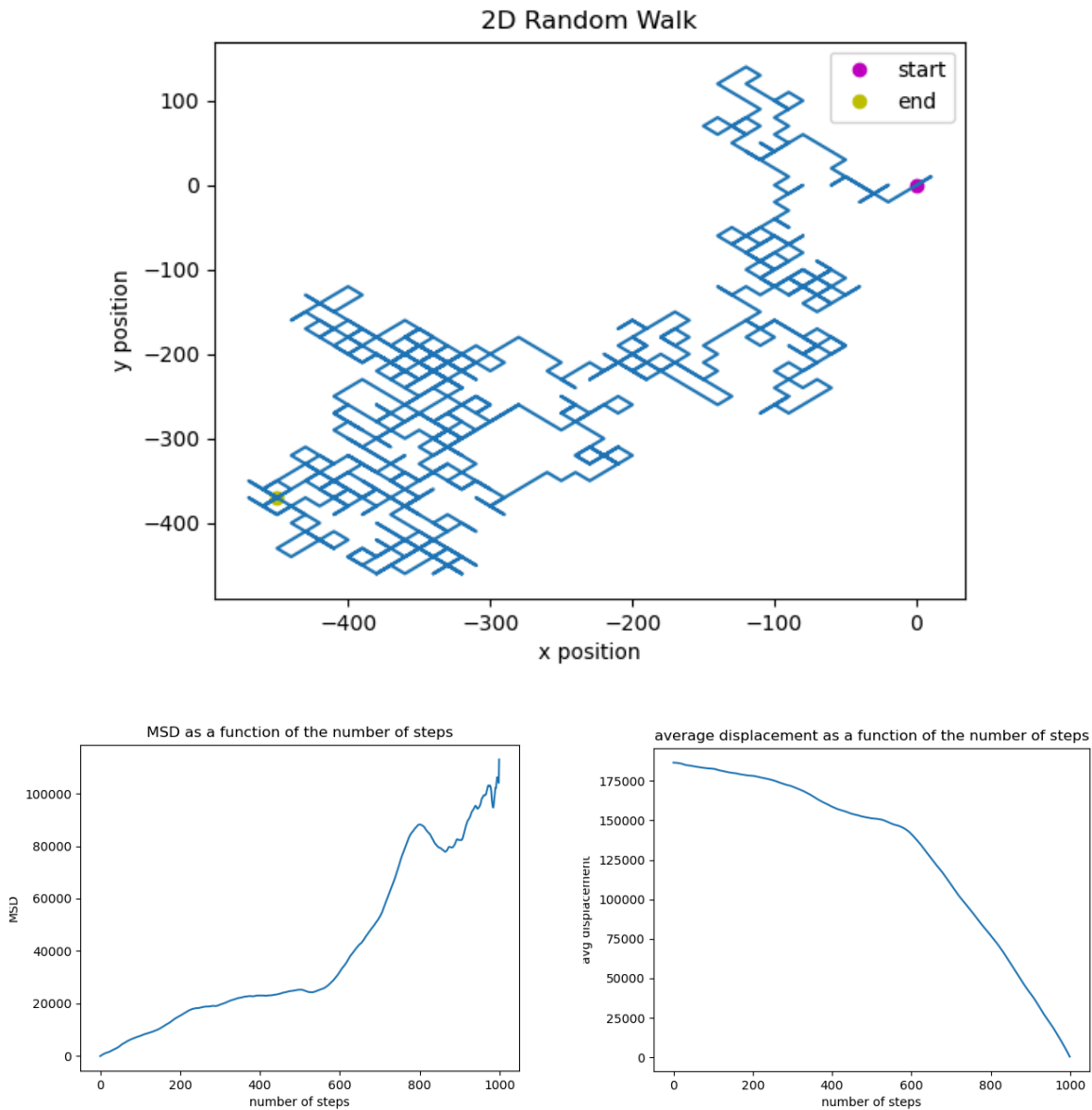


PHYS 305 homework 4 write-up

1. Self-propelled object of mass m :



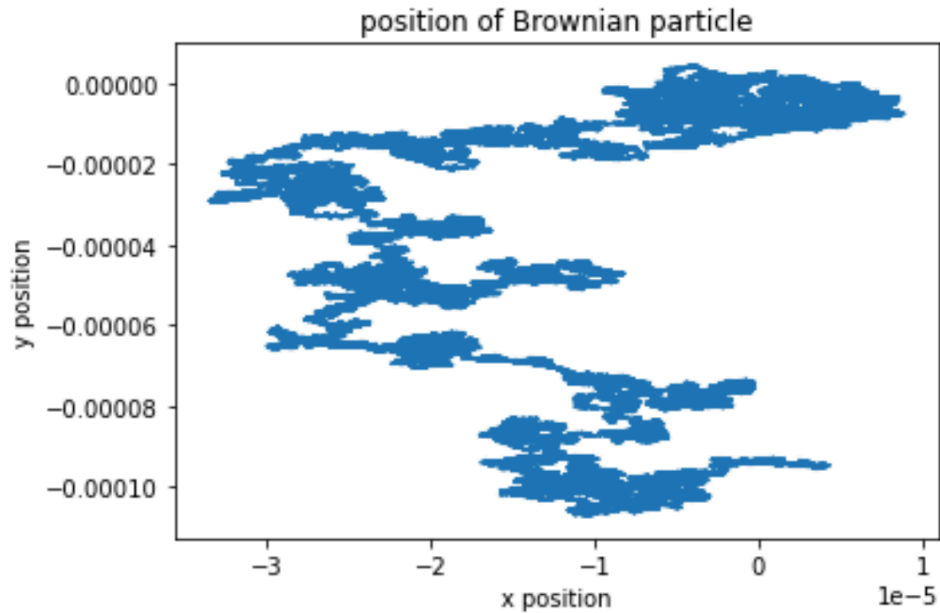
2. 2D random walk:



The average displacement and the squared displacement (MSD) over the entire walk can be seen in the plots above. This does agree with what we saw in class even though it is a bit more difficult to see in 2D. In one dimension, we found that the MSD curve followed the same general trend as the random motion of the particle. With this problem, we are using two dimensions so the MSD curve depends on the variable r which is the total distance away from the previous point, dependent on x and y for that movement. We can see that the start and end points are relatively far apart which explains why the MSD curve is fairly steep and *could* be fit with a linear line.

3. Brownian particle using Langevin dynamics:

Position with $T = 0.001$:



I was having trouble getting the code to return the graph for MSD so I lowered the total time to 10^{-6} , still with 10^{-9} time step. The result was the following position plot and the following MSD plot. From the MSD plot, it is clear that the curve starts as a quadratic function at the start of the time interval and will become linear for times larger than 10^{-6} .

