HW 9: Section 5.5 and 5.6

Due: Monday, October 7th in SQRC by 9pm

Learning Goals:

- Reason about problems involving projectile motion.
- Use integrals to compute work done.

Questions:

1. I'm standing at the foot of a hill with slope 1, (i.e. it follows the line $y = x$. If I throw a ball from a height of 2 meters, at an angle of $\pi/6$, with a velocity of 10 meters per second, where does it hit the hillside?

2. Just as in problem 1, I throw a ball with initial height of 2 meters at a speed of 10m/s. At what angle should I throw to maximize the distance I throw it up the hill?

3. Compute the mass and center of mass of an object with density $\rho(x) = 3 - \frac{x}{6}$ kg/m, $0 \leq x \leq 6$. Briefly explain in terms of the density function why the center of mass is not at $x = 3$.

4. A force of 10 pounds stretches a spring 2 inches. Find the work done in stretching this spring 3 inches beyond its natural length.

5. A bucket is lifted a distance of 80 feet at the rate of 4ft/s. The bucket initially contains 100 pounds of sand but leaks at a rate of 2 lbs/s. Compute the work done.