Homework S1

1. Find (as a number) the area in first quadrant bounded by the curve $y = 9x - x^3$.

2. Find (as a number) the area below the x-axis bounded by the curve $y = x^2 - x - 6$.

3.   (a) Use integration based on vertical rectangles to find the area, as a number, between the curves $x^2 + y = 4$ and $3x - y = 0$. Show the integral(s) explicitly, as well as the calculations, used to find your answer.

    (b) Use integration based on horizontal rectangles to find the area, as a number, between the $x^2 + y = 4$ and $3x - y = 0$. Show the integral(s) explicitly, as well as the calculations, used to find your answer.

4. A garage door spring has a natural length of 3 feet. When stretched to 6 feet, the spring exerts a force of 60 pounds. **Set up** an integral to calculate how much work must be done to stretch the spring from its natural length to a length of 9 feet.

5. A swimming pool is 10 feet wide, 16 feet long, has a depth of 10 feet at the deep end, and a depth of 2 feet at the shallow end with a straight sloping floor in between. The owner has been pumping the water out of the pool onto the ground near the pool. At the present time, the water remaining in the pool just covers the sloping part of the pool.

    (a) **Set up** an integral to calculate the amount of work *already done* by the pump to remove the top 2 feet of water from the pool.

    (b) **Set up** an integral to calculate the amount of work that *remains to be done* by the pump to remove the rest of the water from the pool.