MTH 112 Exam 2 Review

1.) Suppose a 30 foot chain with a linear weight density of $\rho = 3$ lbs/ft is initially resting on the ground. How much work is needed to lift the chain so that it is dangling from the top of a 50 foot building?

2.) Suppose we have a hemispherical tank of radius 4 meters (given by taking the curve $y = -\sqrt{16 - x^2}$ on $-4 \leq x \leq 4$ and rotating around the x-axis) that is filled with a fluid having density $\rho = 500$ kg / m^3. How much work is required to empty the tank from the top? You may use $g = 10\text{m/s}^2$.

3.) Find the centroid of the shape enclosed by $y = x^2$ and $y = 5$. (HINT: You should be able to argue that one of the coordinates is zero by symmetry.)

4.) Find the center of mass of the region contained between the curves $x = y^2$ and $x = 2 - y$ if the density of the region is given by $\delta(y) = 4(y + 2)$.

5.) Compute $\displaystyle\int_1^2 x^2 \ln(2x)\, dx$.

6.) Compute $\displaystyle\int x^2 e^{3x}\, dx$.

7.) Compute $\displaystyle\int \sin^2(x)\cos^5(x)\, dx$.

8.) Compute $\displaystyle\int \tan^4(x)\sec^4(x)\, dx$.

9.) Compute $\int_0^{\pi/4} \sin^4(\theta)\, d\theta$

10.) Compute $\int \tan^5(x)\sec^3(x)\, dx$.

11.) Compute $\int e^{3x}\cos(x)\, dx$.

12.) Compute $\int_0^{\pi^2/4} \cos(\sqrt{x})\, dx$.