MATH 166
SUMMER 2012
EXAM 1

1. (32 pt) Evaluate the following integrals.

a) $\int \tan^2(x)\ dx$ b) $\int \frac{x+1}{x+2}\ dx$ c) $\int_{\ln(3)}^{\ln(8)} 2e^x\sqrt{e^x+1}\ dx$

d) $\int_1^{e^{\frac{\pi}{4}}} \frac{dx}{x((\ln(x))^2+1)}$

2. (20 pt) You have a solid object that has a base that is a circle of radius R. Cross sections of the object perpendicular to the base are rectangles that are half as tall as they are wide. Find the volume of this object.

3. (24 pt) Consider the region bounded by $x = y^2 - 4$ and $x = 4 - y^2$.
   a) Find the volume obtained when this region is revolved about the line $x = -5$.
   b) Find the volume obtained when this region is revoled about the line $y = 3$.

4. (12 pt) A 20 lb bucket is filled with 100 lbs of water. This bucket is drawn up a 50 foot well by a rope that weighs $\frac{1}{2}$ lb/ft. How much work is done in rasing this bucket from the well.

5. (12 pt) A pyramid with square base of length a and height h is to be made out of concrete that weighs ρ lbs/ft^3. How much work will be done in laying the concrete?

6. (10 pt) Let $f(x)$ be a continuous function and A a positive number. Show that the average value of $f(Ax)$ on the interval $[\frac{a}{A}, \frac{b}{A}]$ is the same as the average value of the function $f(x)$ on the interval $[a, b]$.