Math 173 Spring 2008 Ch 6 Handout 4/29/08

1. Define definite integrals (but do not evaluate) that represent the volume of the solid of revolution formed by rotating the region bounded by
   $f(x) = 1 + \sqrt{x},\ y = x^3 + 1,\ x = 0$, and $x = 1$

   (a) about the *x*-axis.

   (b) about the *y*-axis.

   (c) about the line $y = -1$

   (d) about the line $y = 3$

2. For each part of Problem 1, slice along the other axis to find a different definite integral that represents the given volume.

3. A metal plate, with constant density $4\ \text{gm}/\text{cm}^2$, has a shape bounded by
   $y = x^3,\ y = 0,\ x = 2$.

   (a) Find the total mass of the plate.
   (b) Find the center of mass of the plate.
   (c) Use the Theorem of Pappus to find the volume of the solid formed by revolving the region about the line $x = 4$

4. Find the arc-length of the curve determined by $x(t) = e^t \cos t,\ y(t) = e^t \sin t$ for $0 \le t \le \pi$.

5. Hooke's Law says that the force, *F*, required to compress a spring a distance of *x* meters from its resting position is given by $F(x) = kx$, for some constant *k*. If the work required to compress the spring from $x = .2$ meters to $x = 1$ meters is $.05$ joules, find the value of the constant *k*.

6. You need to lift a 5lb bucket containing 2 gal (16 lb) of water from the ground onto a platform 20 feet high. You have 10 ft of chain weighing a total of 5 lbs and 10 ft of rope weighing a total of 2 lbs. If the rope is tied to the bucket (and also to the chain), how much work is done in lifting the water onto the platform?

7. A spherical tank with interior radius of 4 ft is buried 1 ft below ground level. If the tank is half full of water, how much work is done in emptying the tank?