Week 4 Week in Review

courtesy: David J. Manuel

(covering 7.1, 7.2, and Exam I Review)

1 Section 7.1

1. Evaluate the following integrals:

   (a) $\int x \cos x \, dx$

   (b) $\int_0^1 x^2 e^{-2x} \, dx$

   (c) $\int x^2 \ln x \, dx$

2 Exam I Review

1. Evaluate the following integrals:

   (a) $\int_1^e \frac{\sqrt{\ln(x)}}{x} \, dx$

   (b) $\int x\sqrt{1-9x^2} \, dx$

2. Find the area of the regions bounded by the following curves:

   (a) $y = x^2 - 2x, y = 2x, x = 1$, and $x = 6$

   (b) $y = 0$, $x = y^3$ and $x = 16 - y^3$.

3. Find the volumes of the solids described below:

   (a) Formed by rotating the region bounded by $y = \dfrac{1}{x}$, $y = 0$, $x = 1$, and $x = 5$ about the x-axis.

   (b) Formed by rotating the region bounded by the x-axis, $x = 1$, and $y = x^3$ about the line $x = 1$.

   (c) Formed by rotating the region bounded by $x = 2y^3$ and $x = 4y^2$, about the line $y = -2$

   (d) Base of the solid is the region enclosed by the y-axis, $y = 1$, and $y = \sqrt{x}$. Cross-sections perpendicular to the y-axis are semicircles.

4. A 50-foot rope that weighs 25 pounds hangs from the top of a large building. How much work is required to pull 10 feet of rope to the top?

5. A hemispherical tank of radius 2 ft is filled with liquid with weight density $\rho g \dfrac{\text{lb}}{\text{ft}^3}$ to a depth of 1 foot. There is a one foot spout mounted at the top of the tank through which water is drained. Set up the integral that gives the work required to pump the liquid out of the tank through the spout.

6. A tank is 15 m long, 6 m tall, and its ends are in the shape of isosceles triangles which are 10 m across the top (see figure below). If the tank is filled with liquid with weight density $\rho g \dfrac{N}{m^3}$ to a depth of 5 m, set up the integral that gives the work required to pump the liquid out of the tank.