Math 112 – Spring 2011
Examination 1

Please complete the following problems. All work must be shown in order to receive full credit. Answers without explanation will receive *no* credit. The use of books, notes, calculators, or any other external sources of information is not allowed during this examination.

1.(12 pts.) Use cylindrical shells to find the volume of the solid obtained by revolving the region bounded by $x = y^2, y = \sqrt{6}$, and $x = 0$ about the x-axis.

2.(12 pts.) Find the length of the curve $x = \frac{1}{3}\left(y^{\frac{3}{2}} - 3y^{\frac{1}{2}}\right)$ for $1 \leq y \leq 9$.

3.(12 pts.) Find the area of the surface generated by revolving the curve $y = \sqrt{2x - x^2}$ for $0 \leq x \leq 2$ about the x-axis.

4.(13 pts.) Find the volume of the solid obtained by revolving the region bounded by $y = x^2$ and $y = 2 - x^2$ about the x-axis.

5.(12 pts.) A 100 foot long cable that weighs 5 lb/ft is hanging vertically from the top of a very tall building. How much work is done lifting the cable to the top of the building?

6.(12 pts.) The base of a solid is the region that is bounded by the graphs of $y = \sqrt{\frac{x}{1+x^2}}$ and $y = -\sqrt{\frac{x}{1+x^2}}$ for $1 \leq x \leq 2$. The cross-sections perpendicular to the x-axis are semi-circles with diameters running along the base of the solid. Find the volume of this solid.

7.(14 pts.) Find the following:

a. $\dfrac{d}{dx}\left[\sqrt{x}\cosh(\sqrt{x})\right]$ **b.** $\displaystyle\int \tanh(3x)\,dx$

8.(13 pts.) Consider the tank that is generated by revolving $y = 4x^2$ for $0 \leq x \leq 1$ about the y-axis. The tank is filled with a fluid weighing 40 lb/ft^3. How much work is done in pumping all of the fluid to a height of 1 ft above the top of the tank?