Fall 2004 MATH 171

Week in Review X

courtesy of David J. Manuel

Section 5.5, 5.7

Section 5.5

1. Given any rectangle with a fixed perimeter, prove the one with the largest area is a square.

2. Given the volume V of a cylinder, find the ratio of h to r which minimizes the surface area of the cylinder.

3. In section 1.2, there is a formula for finding the shortest distance from a point (x_1, y_1) to the line $Ax + By = C$. Derive this formula.

Section 5.7

(NOTE: $\int f(x)\,dx$ refers to the most general antiderivative of f)

4. Explain the difference (if any) between $\dfrac{d}{dx}\left(\int f(x)\,dx\right)$ and $\int \dfrac{d}{dx}(f(x))\,dx$.

5. Given a particle travels along a straight line with constant acceleration a, initial velocity v_0, and initial position s_0, derive each of the following formulas from physics:

   a) $s(t) = \dfrac{1}{2}at^2 + v_0 t + s_0$

   b) $(v(t))^2 - v_0^2 = 2a(s(t) - s_0)$

6. Prove that $\int cf(x)\,dx = c\int f(x)\,dx$