Math 221 – Spring 2005
Practice Exam 2

75 minutes. Closed book. You are allowed a calculator and one 8.5” x 11” sheet of handwritten notes. The table of integrals in appendix C will be provided on the exam. Not all problems on Exam 2 will have a matching problem on this practice test, but this practice test should give you a sense of what the exam will be like as you study.

1. Find the centroid of the region bounded by \( y = x^2 \), \( y = 2 \), \( x = -1 \), and \( x = 1 \).

2. Find the volume of the solid formed by rotating the region in the plane bounded by \( x + y = 1 \), \( x + y = 3 \), \( y = 1 \), and \( y = 3 \) about the \( x \)-axis.

3. Evaluate \( \int \arctan(2x) \, dx \).

4. Evaluate \( \int \frac{2x \, dx}{x^3 - x} \).

5. Evaluate \( \int e^{\sqrt{x}} \, dx \).

6. Evaluate \( \int \sin^2(x) \cos^2(x) \, dx \).

7. Evaluate \( \int_{0}^{3/2} \sqrt{9 - 4x^2} \, dx \).

8. Evaluate \( \int_{0}^{1} x^2 \sin(\pi x) \, dx \).

9. Suppose \( \frac{dy}{dx} = 4 - y^2 \) with \( y(0) = 0 \). What is \( y(1) \)?

10. Evaluate \( \int_{2}^{4} \frac{dx}{x^2 \sqrt{4x^2 - 9}} \). You need to give the exact answer, not a decimal approximation.

11. Evaluate \( \lim_{x \to 0} \frac{2^{2x} - 4}{x} \).

12. Evaluate \( \lim_{x \to 0} \frac{\cos(x) + \sin(x) - 2}{x} \).