Mathematics 181A — Fall 2010

Exam 2

October 7, 2010

_____
Name

Technology used: _____ **Only write on one side of each page.**
Show all of your work. Calculators may be used for numerical calculations and answer checking only.

1. [10, 10, 10 points] Evaluate the following integrals. Show all of your work.

1. $\int \cos^5(3x)\ dx$
2. $\int \sec^4(2x)\ dx$
3. $\int y \ln(y)\ dy$

2. [15 points] Find the length of the curve $y = x^{1/2} - (1/3)\,x^{3/2}$, $1 \le x \le 4$.

3. [15 points] Find the area of the surface generated by revolving the curve $y = \sqrt{4x - x^2}$, $1 \le x \le 2$ about the x-axis.

4. [15 points] Solve the initial value problem $\frac{dy}{dx} = \frac{y \ln(y)}{1+x^2}$, $y(0) = e^2$.

6. [10 points] A deep dish-apple pie, whose internal temperature was 220°F when removed from the oven was set out on a breezy 40°F porch to cool. Fifteen minutes later, the pie's internal temperature was 180°F. How much longer did it take for the pie to cool to 70°F?

7. [15 points] A disk of radius 2 is revolved around the y-axis to form a solid sphere. A round hole of radius $\sqrt{3}$, centered on the y-axis is bored through the sphere. Find the volume of material removed from the sphere.

Extra Credit [5 points] At each point on the curve $y = 2\sqrt{x}$, a line segment of length $h = y$ is drawn perpendicular to the xy-plane. Set up an integral that equals the area of the surface formed by these perpendiculars from $x = 0$ to $x = 3$. [Note that this is **not** a surface of revolution so none of the formulas in Chapter 6 apply. Develop your own integral by using Riemann sums to estimate the area of the surface.]