Math 128– Block 8, 2009

## MIDTERM REVIEW

Here are the rules for the exam on Thursday: You can pick the exam up in the classroom anytime after 9:15 . Take the exam anywhere in Tutt Science Center. You may use the formula sheet I gave you for the last quiz, and the one 3x5 card of notes (both sides) that you prepared for yourself, but no other books or notes, and no help from other people. You may use the arithmetic, trig and inverse trig, exponential and log functions, and graphing only on your calculator (or computer)–no calculus, or programmable features. Show all your work. Sign the Honor Code and return your exam to me in TSC206A by 3PM. The exam is about 3 times as long as a quiz.

Here are some sample problems:

1. Evaluate the following integrals (or show divergent). Note that some are indefinite, some definite, some improper. Only the Basic Forms on the formula sheet I gave you can be used without proof.

   a. $\int \frac{\sqrt{x^2-1}}{x}dx$

   b. $\int_1^2 \frac{\ln x}{\sqrt{x}}dx$

   c. $\int \sin^7 x\,dx$

   d. $\int \frac{1}{x^2-4x+3}dx$

   e. $\int_2^\infty \frac{3}{\sqrt[4]{x^3-1}}dx$

2. A tank full of water has the shape of a paraboloid of revolution, formed by revolving the curve $y = \frac{x^2}{2}$ from $x = 0$ to $x = 4$ around the y axis. Here $x$ and $y$ are measured in feet.

   a. Find the volume of water in the full tank.

   b. Find the amount of work required to pump all the water out of the top of the tank. (Water weighs 62.5 lbs per cubic foot.)

3. a. The region bounded by $y = \frac{1}{\sqrt{x}}$, $x = 1$ and $y = 0$ is revolved around the $x$ axis. Determine whether the resulting solid of revolution has finite volume, and if so, find the volume.

   b. The region bounded by $y = \frac{1}{\sqrt{x}}$, $y = 1$ and $x = 0$ is revolved around the $y$ axis. Determine whether the resulting solid of revolution has finite volume, and if so, find the volume.

4. Tell whether each of the following series or sequence converges, and why. If you know the value it converges to, tell that as well.

   a. $\sum_{n=1}^\infty \frac{1}{n^2+n}$

   b. $\sum_{n=1}^\infty \frac{1}{2^n-n^2}$

   c. $1, \frac{1}{2}, 1, \frac{1}{2}, 1, \frac{1}{2}, \cdots$

   d. $\sum_{n=1}^\infty \frac{1}{n\ln(n)}$

   e. $\sum_{n=1}^\infty \frac{2n-3}{3n+1}$

   f. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \cdots, \frac{n}{n+1}, \cdots$

   g. $\sum_{n=1}^\infty (.98)^n$