MATH 222 (002 and 004) Fall 2013
Midterm 1.

Name: ________________________________

Circle your TA’s name from the following list.

Ed Dewey    Stephen Neal    Dae Han Kang    Sharath Prased    Alisha Zachariah

Chris Janjigian    Animesh Anand    Reese Johnston    Jeremy Schwend    Alex Troesch

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<th>Problem 1</th>
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Instructions

- Write neatly on this exam. If you need extra paper, let us know.
- You must show all of your work, except on Problem 1 which is a true/false problem.
- All problems graded out of 10.
- No calculators, books, or notes (except for those notes on your 3 × 5 notecard.)

Formulas

- \( \int \sec x \, dx = \ln | \sec x + \tan x | + C. \)
- \( \int \csc x \, dx = - \ln | \csc x + \cot x | + C. \)
- \( \cos(\arcsin x) = \sqrt{1 - x^2} \)
- \( \sec(\arctan x) = \sqrt{1 + x^2}. \)
- \( \tan(\arccos x) = \sqrt{x^2 - 1}. \)
- \( \csc(\arcsin x) = \frac{1}{x} \)
- \( \cot(\arcsin x) = \frac{\sqrt{1-x^2}}{x} \)
1. For each statement below, CIRCLE true or false. You do not need to show your work.

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(a) $\int_{3}^{\infty} \frac{x - \sqrt{x}}{3x^3 + 11} dx$ is a finite number.

(b) $\int_{3}^{\infty} \frac{1}{2x^2} dx \geq \int_{3}^{\infty} \frac{1}{x^2 + 3x} dx$.

(c) $\int \cos^2(5\theta + 1) \sin(5\theta + 1) d\theta = -\frac{1}{15} \cos^3(5\theta + 1) + C$.

(d) $\int_{2}^{10} \frac{1}{\sqrt{x-3}} dx$ exists.

(e) Let $I_n = \int x^n e^x dx$ then a reduction formula for these integrals is given by:

$$I_n = x^n e^x + (n - 1)I_{n-1}.$$
2. Compute $\int \frac{dx}{\sqrt{2x-x^2}}$. 
3. Use integration by parts (one or more times) to compute $\int e^z \sin(3z) \, dz$. 
4. Compute \( \int \frac{7}{(t-1)(2t+5)} \, dt \).
5. Compute \( \int \frac{dx}{\sqrt{1-e^{2x}}} \).
6. Compute \( \int_1^\infty \frac{1}{x(x^2+1)} \, dx \). (You may freely use the formula \( \frac{1}{x(x^2+1)} = \frac{1}{x} - \frac{x}{x^2+1} \).)