MATH 1272: CALCULUS II
SAMPLE MIDTERM TEST I

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You may not use a calculator, notes, books, etc. Only the exam paper and a pencil or pen may be kept on your desk during the test. Here is a list of trigonometric substitutions, which you may or may not need for the test:

Expression: $\sqrt{a^2 - x^2}$	Substitution: $x = a \sin \theta$.
Expression: $\sqrt{a^2 + x^2}$	Substitution: $x = a \tan \theta$.
Expression: $\sqrt{x^2 - a^2}$	Substitution: $x = a \sec \theta$.

Good luck!

Problem 1. Evaluate the following integral:

$$\int x^2 e^x dx.$$

Problem 2. Evaluate the following integral:

$$\int \sin^2 x \cos^3 x dx.$$

Problem 3. Evaluate the following integral:

$$\int \frac{1}{x^2 \sqrt{9 - x^2}} dx.$$

Problem 4. Evaluate the following integral:

$$\int_0^1 \frac{2x^3}{x^2 + 1} dx.$$

Problem 5. Evaluate the following integral:

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

Problem 6. Determine whether the integral is convergent and, if yes, evaluate it:

$$\int_1^\infty \frac{\ln x}{x^3} dx.$$

Problem 7. Determine whether the integral is convergent and, if yes, evaluate it:

$$\int_0^4 \frac{1}{\sqrt{4 - x}} dx.$$

Problem 8. (1) Use the Midpoint Rule to approximate the following integral with $n = 2$:

$$\int_1^5 x^2 dx.$$

(2) Compare your result to the actual value to determine the error.

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