MATH 1552-02 Sample Test 1

June 16, 2004   **Name:** _____

Answer all questions on other sheets of paper. Write only your name on this page.

1. (10 points) Evaluate the integral

$$\int x \cos \pi x \, dx.$$

2. (10 points) First make a substitution and then use integration by parts to evaluate the integral

$$\int x^5 e^{x^2} \, dx.$$

3. (10 points) Evaluate the integral

$$\int_0^{\pi/2} \sin^2 x \cos^2 x \, dx.$$

4. (10 points) Evaluate the integral

$$\int \sec^6 t \, dt.$$

5. (10 points) Evaluate the integral

$$\int \frac{dx}{x^2 \sqrt{16x^2 - 9}}$$

6. (10 points) Evaluate the integral

$$\int \frac{x-1}{x^3 + x} \, dx.$$

7. (10 points) Write out the expression in the form of partial fractions. Determine the numerical values of all coefficients, but do not integrate the expression.

$$\frac{x^3}{x^2 + 4x + 3}$$

8. (10 points) Determine whether the integral is convergent and evaluate it if appropriate.

$$\int_1^\infty \frac{\ln x}{x^2} \, dx$$

9. (10 points) What is the graph of the equation

$$4x^2 + 4y^2 + 4z^2 - 8x + 16y = 1?$$

10. (10 points) If a child pulls a sled through the snow with force of 50 N exerted at an angle of 38° above the horizontal, find the horizontal and the vertical components of the force.

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<div align="center">Helpful trigonometric formulas</div>

$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$

$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$

$\sin x \cos x = \frac{1}{2}\sin 2x$

$\int \tan x \, dx = \ln|\sec x| + C$

$\int \sec x \, dx = \ln|\sec x + \tan x| + C$

$\sec^2 x = 1 + \tan^2 x$

$\frac{d}{dx}\tan x = \sec^2 x$

$\frac{d}{dx}\sec x = \sec x \tan x$

$\sin A \cos B = \frac{1}{2}(\sin(A - B) + \sin(A + B))$

$\sin A \sin B = \frac{1}{2}(\cos(A - B) - \cos(A + B))$

$\cos A \cos B = \frac{1}{2}(\cos(A - B) + \cos(A + B))$