Math 1272: Calculus II
Midterm I Review

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Evaluate

$$\int x \sec^2 x \, dx.$$

Evaluate

$$\int x \tan^2 x \, dx.$$

Evaluate

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

Evaluate

$$\int \tan^3\theta \sec^3\theta \, d\theta.$$

Determine if the following integrals are convergent or divergent. If convergent, evaluate the integral.

1. $$\int_{\pi}^{\infty} \frac{x^2+1}{x-2}\,dx.$$

2. $$\int_{1}^{2} \frac{2u}{\sqrt{u^2-1}}\,du.$$

3. $$\int_{0}^{\infty} x^2 e^{-x}\,dx.$$

Evaluate the integral

$$\int \frac{3x^2 + 6x + 2}{x^3 + 3x^2 + 2x}\, dx.$$

Use the midpoint rule with $n = 3$ to approximate $\int_0^1 x^3\,dx$.

Find the center of mass of the region $\mathcal{R}$ in the plane bounded by the curves

$$x = 0,\ x = 1,\ y = 0,\ \text{ and } y = \sqrt{x^2 + 1}.$$

Find the arclength of the curve

$$y = \ln(\sec x), \quad 0 \leq x \leq \pi/2.$$

Find the area of the surface of revolution obtained by rotating the curve

$$y = \sin x, \quad 0 \le x \le \pi/2$$

about the x-axis. You may recall

$$\int \sec^3 \theta \, d\theta = \frac{1}{2} \sec \theta \tan \theta + \frac{1}{2} \ln |\sec \theta + \tan \theta| + C.$$