Math 141
Test 1
Chamberlin

Name ______________________

In order to get all the points available on each problem, show how you arrive at your solutions. If an answer is correct even though your method is incorrect, then you will not get full credit.

1. Evaluate the following integrals.

a) $\int \sec^4 x \tan^3 x \, dx$ u = sec x

$$\frac{\sec^6 x}{6} - \frac{\sec^4 x}{4} + C$$

b) $\int \frac{x^2+4x}{x-2} dx$ use long division

$$\frac{x^2}{2} + 6x + 12 \ln|x-2| + C$$

c) $\int \sin^3 x \cos^2 x \, dx$

$$\frac{\cos^5 x}{5} - \frac{\cos^3 x}{3} + C$$

2. Evaluate the integral using one of the following methods: u-substitution, integration by parts, or trig substitution.

a) $\int e^x \sin x \, dx$

$$\frac{1}{2}\left[-e^x \cos x + e^x \sin x\right] + C$$

b) $\int \frac{1}{x^3\sqrt{x^2-1}} dx$

$$\frac{1}{2}\left[\sec^{-1} x + \frac{\sqrt{x^2-1}}{x^2}\right] + C$$

(see notes)

3. Evaluate the integral: $\int \frac{5x^2+20x+6}{x^3+2x^2+x}dx$

$$6\ln|x| - \ln|x+1| - \frac{9}{x+1} + C$$

4. Use the Comparison Theorem to determine whether or not $\int_0^\infty \frac{\arctan x}{2+e^x}dx$ converges. Justify your reasoning with meticulous explanations.

converges. see notes

5. Evaluate the limit: $\lim_{x\to\infty} x^3 e^{-x^2}$

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