

232 TEST 3

*You may use your notebook during the last fifteen minutes of this exam.
You may NOT use calculators, cell phones, loose papers, or peeking.*

15 pts each → 105 total

Math 232
November 17, 2011

Name: _____

* key *

v2

By printing my name I pledge to uphold the honor code.

Please do not write more on the test paper than what is asked for.

- Complete the first step of solving the integral below using the method of substitution. Describe your choices for u and du and the result of this substitution, but do not do any solving past the substitution step.

$$\int \frac{\cos(\ln x)}{x} dx = \underline{\int \cos u du}$$

integral after substitution

using $u = \underline{\ln x}$, $du = \underline{\frac{1}{x} dx}$.

- Complete the first step of solving the integral below by using trigonometric identities to set up a substitution. Describe the rewritten integral, your choices for u and du , and the result of this substitution, but do not do any solving past those steps.

$$\int \sin^3 x \cos^6 x dx = \underline{\int (1 - \cos^2 x) \cos^6 x \sin x dx}$$

rewritten integral

$$= \underline{\int (1 - u^2) u^6 du}$$

integral after substitution

using $u = \underline{\cos x}$ and $du = \underline{\sin x dx}$.

- Write the improper integral below as a sum of limits of proper integrals. Do not solve the integral, just write down the decomposition. (Hint: The key here is to split up the integral enough and in the right locations.)

$$\int_0^\infty \frac{x-3}{x(x-2)} dx = \lim_{A \rightarrow 0^+} \int_A^1 \frac{x-3}{x(x-2)} dx + \lim_{B \rightarrow 2^+} \int_1^B \frac{x-3}{x(x-2)} dx + \lim_{C \rightarrow 2^+} \int_C^3 \frac{x-3}{x(x-2)} dx$$

sum of limits of proper integrals

$$+ \lim_{D \rightarrow \infty} \int_3^D \frac{x-3}{x(x-2)} dx$$



4. Complete the first step of solving the definite integral below using the method of integration by parts. Describe your choices for u , v , du , and dv and the resulting integration by parts conclusion, but do not do any solving past the integration by parts step.

$$\int_1^3 \frac{\ln x}{x^2} dx = \frac{-\left[\frac{\ln x}{x}\right]_1^3 + \int_1^3 \frac{1}{x^2} dx}{\text{result of integration by parts}}$$

using $u = \ln x$, $v = -x^{-1}$, $du = \frac{1}{x} dx$, and $dv = x^{-2} dx$.

5. Use the Second Fundamental Theorem of Calculus to calculate the following derivative:

$$\frac{d}{dx} \left(\int_0^{3x} \sec^2 t dt \right) = \frac{3 \sec^2 3x}{\text{result of differentiation}}$$

6. Complete the first step of solving the integral below using the method of trigonometric substitution. Describe your choices for x and dx in terms of u and the result of this substitution, but do not do any solving past the substitution step.

$$\int \frac{x^2}{\sqrt{4x^2 + 9}} dx = \frac{\int \frac{3}{4} \tan^2 u - \frac{3}{2} \sec^2 u du}{\text{integral after substitution}}$$

using $x = \frac{3}{2} \tan u$ and $dx = \frac{3}{2} \sec^2 u du$

7. Write down the partial fractions decomposition for the integral below. Your answer should include letters such as A , B , C , and so on. Do not solve for these coefficients or attempt to solve the integral.

$$\int \frac{(x-1)(x-3)}{(x^2-4)(x^2+1)^2} dx = \frac{\int \frac{A}{x+2} dx + \int \frac{B}{x-2} dx + \int \frac{Cx+D}{x^2+1} dx + \int \frac{Ex+F}{(x^2+1)^2} dx}{\text{integral after partial fractions decomposition}}$$

Bonus question: How did you do on this exam?