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.

Math 232
November 17, 2011

Name: * key * V1
By printing my name I pledge to uphold the honor code.

15 pts each → 105 total

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

1. 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.

$$\int_1^3 \frac{\ln x}{x^2}\,dx = -\left[\frac{\ln x}{x}\right]_1^3 + \int_1^3 \frac{1}{x^2}\,dx$$

result of integration by parts

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

2 ends
1 dx
-5 x 1st
-3 x after
15/10/7/4

2. 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.

$$\int \frac{(x-1)(x-3)}{(x^2-4)(x^2+1)^2}\,dx = \int \frac{A}{x+2}\,dx + \int \frac{B}{x-2}\,dx + \int \frac{Cx+D}{x^2+1}\,dx + \int \frac{Ex+F}{(x^2+1)^2}\,dx$$

$(x+2)(x-2)$

integral after partial fractions decomposition

3. 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.

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

integral after substitution

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

4. 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.

$$\int \sin^3 x \cos^6 x \, dx = \underbrace{\int (1-\cos^2 x)\cos^6 x \sin x \, \cancel{dx}}_{\text{rewritten integral}} \underbrace{= -\int (1-u^2)u^6 \, du}_{\text{integral after substitution}}$$

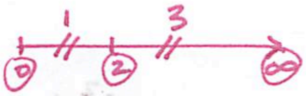
using $u = \underline{\cos x}$ and $du = \underline{-\sin x \, dx}$.

6 3
33

5. 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.)

$$\int_0^\infty \frac{x-3}{x(x-2)}\,dx = \underbrace{\lim_{A\to 0^+} \int_A^1 \frac{x-3}{x(x-2)}\,dx + \lim_{B\to 2^-} \int_1^B \frac{x-3}{x(x-2)}\,dx}_{\text{sum of limits of proper integrals}} + \lim_{C\to 2^+} \int_C^3 \frac{x-3}{x(x-2)}\,dx$$

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



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

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

−3 for constants
−2 stray lnd

7. 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.

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

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

Bonus question: How did you do on this exam?