out of $\underline{\underline{80}}$

232 EXAM 3

You may use your notebook during the last 10 minutes of this exam.

You may NOT use calculators, cell phones, loose papers, or peeking.

Math 232
April 11, 2014

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

1. Calculate each of the following. Show your work.

8 pts

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

$= \int (4x^{-1} - 4x^{-2} + x^{-3})\,dx = \boxed{4\ln|x| - \frac{4}{-1}x^{-1} + \frac{1}{-2}x^{-2} + C}$

$4\ln|x| + 4x^{-1} - \frac{1}{2}x^{-2} + C$

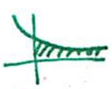
8 pts

B) $\int_1^2 \frac{x}{x^2+1}\,dx$ $\left(\begin{array}{l} u = x^2+1 \\ du = 2x\,dx \end{array}\right)$

$= \frac{1}{2}\int_{x=1}^{x=2} \frac{1}{u}\,du = \frac{1}{2}\left[\ln|u|\right]_{x=1}^{x=2} = \frac{1}{2}\left[\ln|x^2+1|\right]_1^2$

$= \boxed{\frac{1}{2}(\ln 5 - \ln 2)}$

8 pts

C) $\int_0^{\infty} e^{-x}\,dx$  ...

$= \lim_{B\to\infty} \int_0^B e^{-x}\,dx = \lim_{B\to\infty}\left[-e^{-x}\right]_0^B = \lim_{B\to\infty}\left(-e^{-B} + e^{-0}\right) = \boxed{1}$ (!)

$e^{-B} \to 0$, $e^{-0} \to 1$

8 pts

D) $\frac{d}{dx}\left(\int_3^{\sin x} \tan(e^t)\,dt\right)$

$= \boxed{\tan(e^{\sin x})(\cos x)}$, by FTC II

32

$48 = 4 \times 12$
$32 = 8 \times 4$
80

* key *

2. Three of the four integrals below can be solved using integration by substitution. Choose a u and calculate the corresponding du for those integrals. For the remaining integral circle "not sub."

4 A) $\int \frac{\sqrt{\ln x}}{x}\,dx$ $u =$ ln x , $du =$ $\frac{1}{x}\,dx$ or (not sub)

4 B) $\int \frac{x^4+5}{4x^3}\,dx$ $u =$ / , $du =$ / or (not sub)

4 C) $\int x(x+5)^{\frac{7}{2}}\,dx$ $u =$ x+5 , $du =$ dx or (not sub) (w/ back-sub $x = u-5$)

4 D) $\int \frac{e^{\frac{1}{x}}}{x^2}\,dx$ $u =$ $\frac{1}{x}$, $du =$ $\frac{-1}{x^2}\,dx$ or (not sub)

3. Three of the four integrals below can be solved using integration by parts. Choose u and dv for those integrals. For the remaining integral circle "not parts."

4 A) $\int e^x \cos x\,dx$ $u =$ e^x (or cos x) , $dv =$ cos x dx (or $e^x\,dx$) or (not parts) (twice and solve)

4 B) $\int e^x \sin(e^x)\,dx$ $u =$ / , $dv =$ / or (not parts)

4 C) $\int x \ln x\,dx$ $u =$ ln x , $dv =$ x dx or (not parts)

4 D) $\int \ln x\,dx$ $u =$ ln x , $dv =$ dx or (not parts)

4. For each integral below, briefly describe a method of solution that would work but ***do not actually solve the integral***. For example, you might describe how use identities to set up a substitution, use parts, or some other technique. Be specific about which identities, algebra, u, du, and/or dv are involved.

4 A) $\int \sec^3 x \tan^3 x\,dx$ $= \int \sec^2 x(\sec^2 x - 1)\sec x \tan x\,dx$ by Pyth. id.
now let $u = \sec x$, $du = \sec x \tan x\,dx$.

4 B) $\int \sec^3 x\,dx$ let $u = \sec x$, $dv = \sec^2 x\,dx$ for parts.
... do twice and solve ...

4 C) $\int \sin^3 x \cos^4 x\,dx$ $= \int (1-\cos^2 x)\cos^4 x \sin x\,dx$ by Pyth. id.
now let $u = \cos x$, $du = -\sin x\,dx$.

4 D) $\int \sin^2 x \cos^4 x\,dx$ $= \int \frac{1}{2}(1-\cos 2x)\left(\frac{1}{2}(1+\cos 2x)\right)^2 dx$ by half-angles
multiply out, repeat, and integrate

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