Math 1B
Group Quiz 3
Wed Jan 30, 2008

Names: ____________________
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[2 POINTS] Make the indicated substitution for an unspecified function $f(x)$.

$$u = x^3 \text{ for } \int_2^3 x^2 f(x^3)\,dx$$

$u = x^3$ $\quad x=2 \to u=8$

$\frac{du}{dx} = 3x^2$ $\quad x=3 \to u=27$

$du = 3x^2 dx$

$\frac{1}{3}du = x^2 dx$

$\frac{1}{3}\int_8^{27} f(u)\,du$

$\frac{1}{2}$ POINT EACH

[6 POINTS] Evaluate the following integrals **algebraically**. **NO CREDIT FOR CALCULATOR-ONLY ANSWERS.**

(a) $\displaystyle\int \frac{3-2x}{x+5}\,dx$

$u = x+5 \to x = u-5$

$du = dx$

$\int \frac{3-2(u-5)}{u}\,du$

$= \int \frac{13-2u}{u}\,du$

$= \int \left(\frac{13}{u} - 2\right) du$ 1

$= 13\ln|u| - 2u + C$

$= 13\ln|x+5| - 2(x+5) + C$

$= 13\ln|x+5| - 2x + C$ 1 1

$-\frac{1}{2}$ IF MISSING "+C"

(b) $\displaystyle\int_0^{\ln\sqrt{3}} \frac{e^x}{e^{2x}+1}\,dx$

$u = e^x$ $\quad x = 0 \to u = 1$

$\frac{du}{dx} = e^x$ $\quad x = \ln\sqrt{3} \to u = \sqrt{3}$

$\frac{du}{e^x} = dx$

$\frac{\cancel{e^x}}{e^{2x}+1}\frac{du}{\cancel{e^x}} = \frac{e^x}{e^{2x}+1}dx$

$\int_1^{\sqrt{3}} \frac{1}{u^2+1}\,du$

$\frac{1}{2}$ POINT EACH

$= \tan^{-1} u \Big|_1^{\sqrt{3}}$

$= \tan^{-1}\sqrt{3} - \tan^{-1} 1$

$= \frac{\pi}{3} - \frac{\pi}{4} = \frac{\pi}{12}$

DECIMAL ANSWER NOT ACCEPTABLE

[2 POINTS] Use Simpson's Rule to estimate $\int_1^3 f(x)\,dx$ from the given data.

x	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
$f(x)$	2.3	2.4	2.7	3.1	3.5	4.1	4.8	5.3	5.0	4.5	3.9	3.1	2.4	1.7	0.8	0.1	0.0	0.1	0.8

$S_{10} = \frac{1}{3}(0.2)(4.1 + 4(4.8) + 2(5.3) + 4(5.0) + \cdots$
$+ 4(0.8) + 0.1)$ 1

$= 6.7\overline{3}$ 1