MATH 108 – QUIZ 14 – 4 MAY 2011

Answer all of the following questions in the space provided. Show all work as partial credit may be given. Answers without justification, even if they are correct, will earn no credit.

1. (3 pts. each) Find the indicated integrals by using substitution. Don't forget the "$+C$."

(a) $\int \sqrt{4t-1}\,dt$

$u = 4t-1$
$du = 4\,dt$
$\frac{1}{4}du = dt$

$= \int \sqrt{u} \cdot \frac{1}{4}du = \frac{1}{4}\int u^{1/2}du$
$= \frac{1}{4}\cdot\frac{2}{3}u^{3/2}+C = \frac{1}{6}u^{3/2}+C$
$= \frac{1}{6}(4t-1)^{3/2}+C$ //

(b) $\int 2x\,e^{x^2}\,dx$

$u = x^2$
$du = 2x\,dx$

$= \int e^u du = e^u + C$
$= e^{x^2}+C$ //

(c) $\int \frac{y^2}{(y^3+5)^2}\,dy$

$u = y^3+5$
$du = 3y^2\,dy$
$\frac{1}{3}du = y^2\,dy$

$= \int \frac{1}{u^2}\cdot\frac{1}{3}du = \frac{1}{3}\int u^{-2}du$
$= \frac{1}{3}\cdot(-u^{-1})+C = \frac{-1}{3}(y^3+5)^{-1}+C$ //

(d) $\int \frac{\ln(x)}{x}\,dx$

$u = \ln(x)$
$du = \frac{1}{x}dx$

$= \int u\,du = \frac{1}{2}u^2+C$
$= \frac{1}{2}(\ln(x))^2+C$ //

V1

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1. (3 pts. each) Find the indicated integrals by using substitution. Don't forget the "$+C$."

(a) $\int (2t+6)^5\,dt$

$u = 2t+6$
$du = 2\,dt$
$\frac{1}{2}du = dt$

$= \int u^5 \cdot \frac{1}{2}\,du$
$= \frac{1}{2}\int u^5\,du = \frac{1}{12}u^6 + C$
$= \frac{1}{12}(2t+6)^6 + C$ //

(b) $\int x^2 e^{x^3}\,dx$

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

$= \int e^u \cdot \frac{1}{3}\,du = \frac{1}{3}\int e^u\,du$
$= \frac{1}{3}e^u + C = \frac{1}{3}e^{x^3} + C$ //

(c) $\int \frac{y}{2y+1}\,dy$

$u = 2y+1$
$du = 2\,dy$
$\frac{1}{2}du = dy$ /
$y = \frac{1}{2}(u-1)$ /

$= \int \frac{\frac{1}{2}(u-1)}{u} \cdot \frac{1}{2}\,du$
$= \frac{1}{4}\int \frac{u-1}{u}\,du$
$= \frac{1}{4}\int 1 - \frac{1}{u}\,du = \frac{1}{4}(u - \ln(u)) + C$
$= \frac{1}{4}(2y+1 - \ln(2y+1)) + C$ //

(d) $\int \frac{1}{x\ln(x)}\,dx$

$u = \ln(x)$
$du = \frac{1}{x}\,dx$

$= \int \frac{1}{u}\,du = \ln(u) + C$
$= \ln(\ln(x)) + C$ //

V2