Calculus AB

4-5

(Day 2)

Integration by Substitution

Find the indefinite integral. (pg 307)

50) $\frac{1}{8}\int 8\cos 8x\,dx$ $u=8x$, $du=8dx$

$\frac{1}{8}\int \cos u\,du$

$\frac{1}{8}\sin(8x)+C$

56) $\int \sqrt{\tan x}\,\sec^2 x\,dx$

$u=\tan x$

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

$\int \sqrt{u}\,du = \frac{2}{3}u^{\frac{3}{2}}+C$

$\frac{2}{3}\sqrt{(\tan x)^3}+C.$

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58) $\int -\frac{\sin x}{\cos^3 x}\,dx = -\int \frac{1}{u^3}\,du$

$u=\cos x$

$du=-\sin x\,dx$

$=-\int u^{-3}du = -\frac{1}{2}u^{-2}+C$

$\boxed{-\frac{1}{2\cos^2 x}+C}$

68) $\frac{1}{4}\int 4x\sqrt{4x+1}\,dx$

$u=4x+1$

$du=4\,dx$ $\quad \frac{u-1}{4}=x$

$=\frac{1}{4}\int \frac{u-1}{4}\sqrt{u}\,du$

$=\frac{1}{16}\int\left(u^{\frac{3}{2}}-u^{\frac{1}{2}}\right)du$

$\frac{1}{16}\left[\frac{2}{5}u^{\frac{5}{2}}-\frac{2}{3}u^{\frac{3}{2}}\right]+C$

$\frac{1}{40}\sqrt{(4x+1)^5}-\frac{1}{24}\sqrt{(4x+1)^3}+C$

Evaluate the definite integral.

80) $\frac{1}{4}\int_0^2 \frac{4x}{\sqrt{1+2x^2}}\,dx$ $\quad u=1+2x^2$, $du=4x\,dx$

$1+2(2)^2=9$

$\frac{1}{4}\int_1^9 \frac{1}{\sqrt{u}}\,du = \frac{1}{4}\left[2u^{\frac{1}{2}}\right]_1^9$

$1+2(0)^2=1$

$=\frac{1}{2}\left[\sqrt{9}-\sqrt{1}\right]=1$

If you change the upper and lower bounds to u values instead of x values, you do not need to put the original equation back in for your u-substitution.

Assignment:

Day 2

Pg. 297

47-85 odd

Day 3

Pg. 299

87-101 odd, 114