

Antidifferentiation using substitution cont'd.notebook

Using Substitution (cont'd)

ex. 1 Evaluate

a) $\int \tan^7\left(\frac{x}{2}\right) \sec^2\left(\frac{x}{2}\right) dx$

$2 \int u^7 du$ derivative

$2 \frac{u^8}{8} + c$

$\frac{\tan^8\left(\frac{x}{2}\right)}{4} + c$

$u = \tan\left(\frac{x}{2}\right)$

$du = \frac{1}{2} \sec^2\left(\frac{x}{2}\right) dx$

$2 du = \sec^2\left(\frac{x}{2}\right) dx$

b) $\int \frac{dx}{\sin^2(3x)}$

$\int \csc^2(3x) dx$

$\frac{1}{3} \int \csc^2 u du$

$-\frac{1}{3} \cot u + c$

$-\frac{1}{3} \cot(3x) + c$

Recall $\frac{1}{\sin x} = \csc x$

$u = 3x$

$du = 3 dx$

$\frac{du}{3} = dx$

from formula sheet

c) $\int \tan^2 x \sec^2 x dx$

$\int u^2 du$

$\frac{u^3}{3} + c$

$\frac{\tan^3 x}{3} + c$

$u = \tan x$

$du = \sec^2 x dx$

d) $\int \frac{40}{x^2+25} dx$

$40 \int \frac{dx}{x^2+25}$

$40 \left(\frac{1}{5}\right) \arctan\left(\frac{x}{5}\right) + c$

$8 \arctan\left(\frac{x}{5}\right) + c$

follows the pattern

$\int \frac{dx}{a^2+x^2} = \frac{1}{a} \arctan \frac{x}{a} + c$
on formula sheet

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21, 27, 37, 39,
41, 43