More on Antidifferentiation and Substitution

$$\int (x^2 - 6x + 9)^5 \, dx$$

$$= \int \left[(x-3)^2\right]^5 dx$$

$$= \int (x-3)^{10} \, dx$$

$$= \frac{1}{11}(x-3)^{11} + C$$

Rational functions $°N \geq °D$

$$\int \frac{x^2+5x-2}{x+3}\,dx$$

$$\begin{array}{r|rrr} -3 & 1 & 5 & -2 \\ & & -3 & -6 \\ \hline & 1 & 2 & -8 \end{array}$$

$$= \int \left(x+2-\frac{8}{x+3} \right) dx$$

$$= \frac{1}{2}x^2 + 2x - 8 \ln|x+3| + c$$

$$\int \tan x \, dx = \int \frac{\sin x}{\cos x} \, dx$$

$u = \cos x$

$du = -\sin x \, dx$

$-du = \sin x \, dx$

$$\int \tan u \, du = \ln|\sec u| + C$$

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

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

$$= \ln|u^{-1}| + C$$

$$= \ln|\sec x| + C$$

$$\int \cot x \, dx = \int \frac{\cos x}{\sin x} \, dx$$

$u = \sin x$

$du = \cos x \, dx$

$$= \int \frac{1}{u} \, du$$

$$= \ln|u| + C$$

$$= \ln|\sin x| + C.$$

$$\int \sec x \, dx = \int \frac{\sec x(\sec x + \tan x)}{\sec x + \tan x} dx$$

$$u = \sec x + \tan x$$
$$du = (\sec x \tan x + \sec^2 x) dx$$

$$= \int \frac{1}{u} du$$
$$= \ln|u| + C = \ln|\sec x + \tan x| + C$$

$$\int \sec u \, du = \ln|\sec u + \tan u| + C.$$

$$\int \csc u \, du = \ln|\csc u - \cot u| + C$$

$$\int \sec(8x-3)\,dx = \frac{1}{8}\ln\left|\sec(8x-3)+\tan(8x-3)\right| + C$$

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

$u = x^2$

$du = 2x\,dx \qquad = \frac{1}{2}\ln\left|\sec x^2\right| + C.$

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