TUTORING AND TESTING CENTER
NOVA SOUTHEASTERN UNIVERSITY

Academic Resource Sheet

MATH 1200/1250/2100/2200

INTEGRATION RULES (For Calculus II)

Substitution rule

$$\int f(g(x))g'(x)\,dx = \int f(u)\,du \qquad u = g(x)$$

$$\int_a^b f(g(x))g'(x)\,dx = \int_{g(a)}^{g(b)} f(u)\,du$$

Integration by Parts

$$\int u\,dv = uv - \int v\,du$$

$$\int_a^b uv'\,dx = uv\Big|_a^b - \int_a^b vu'\,dx$$

General Formulas	Examples
$\int a\,dx = ax + c$	$\int 3\,dx = 3x + c$
$\int x^n dx = \frac{1}{n+1}x^{n+1} + c \quad n \neq -1$	$\int x^3 dx = \frac{1}{3+1}x^{3+1} + c = \frac{1}{4}x^4 + c$
$\int af(x)\,dx = a\int f(x)\,dx$	$\int 2(3x^4 - 2x)dx = 2\int (3x^4 - 2x)\,dx = 2(\frac{3x^5}{5} - x^2 + c)$
$\int \frac{dx}{x} = \ln\lvert x\rvert + c$	$\int \frac{x^2}{x^3+27}dx = \frac{1}{3}\int \frac{3x^2}{x^3+27}dx = \frac{1}{3}\ln\lvert x^3 + 27\rvert + c$
$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\frac{x}{a} + c$	$\int \frac{dx}{x^2 + a^2} = \frac{1}{a}\tan^{-1}\frac{x}{a} + c$
$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a}\sec^{-1}\lvert\frac{x}{a}\rvert + c$	

Trigonometric Functions	
$\int \sin ax\,dx = -\frac{1}{a}\cos ax + c$	$\int \sin^2 x\,dx = \frac{x}{2} - \frac{\sin 2x}{4} + c$
$\int \cos ax\,dx = \frac{1}{a}\sin ax + c$	$\int \cos^2 x\,dx = \frac{x}{2} + \frac{\sin 2x}{4} + c$
$\int \tan x\,dx = \ln\lvert\sec x\rvert + c$	$\int \tan^2 x\,dx = \tan x - x + c$
$\int \csc x\,dx = -\ln\lvert\csc x + \cot x\rvert + c$	$\int \csc^2 ax\,dx = -\frac{1}{a}\cot ax + c$
$\int \sec x\,dx = \ln\lvert\sec x + \tan x\rvert + c$	$\int \sec^2 ax\,dx = \frac{1}{a}\tan ax + c$
$\int \cot x\,dx = \ln\lvert\sin x\rvert + c$	$\int \cot^2 x\,dx = -\cot x - x + c$

Inverse Trigonometric Functions	
$\int \sin^{-1} x\,dx = x\sin^{-1} x + \sqrt{1 - x^2} + c$	$\int \tan^{-1} x\,dx = x\tan^{-1} x - \frac{1}{2}\ln(1 + x^2) + c$
$\int \cos^{-1} x\,dx = x\cos^{-1} x - \sqrt{1 - x^2} + c$	$\int \sec^{-1} x\,dx = x\sec^{-1} x - \ln(x + \sqrt{x^2 - 1}) + c$

Exponential and Logarithmic Functions	
$\int e^{ax}dx = \frac{1}{a}e^{ax} + c$	$\int \ln x\,dx = x\ln x - x + c$
$\int b^{ax}dx = \frac{1}{a\ln b}b^{ax} + c$	$\int \log_b x\,dx = \frac{1}{\ln b}(x\ln x - x) + c$

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