TABLE OF INTEGRALS

I. Basic Antiderivatives

$\int x^p \, \mathrm{d}\, x = \frac{x^{p+1}}{p+1}, p \neq -1, \text{real}$

$\int \cos x \, \mathrm{d}\, x = \sin x$

$\int \frac{1}{\sin^2 x} \, \mathrm{d}\, x = -\cot x$

$\int \sec x \, \mathrm{d}\, x = \ln|\sec x + \tan x|$

$\int \frac{1}{\sqrt{1-x^2}} \, \mathrm{d}\, x = \arcsin x$

$\int \cosh x \, \mathrm{d}\, x = \sinh x$

$\int \frac{1}{\sqrt{x^2+1}} \, \mathrm{d}\, x = \operatorname{arsinh} x$

$\int \frac{1}{x\sqrt{1-x^2}} \, \mathrm{d}\, x = -\operatorname{sech}^{-1} x$

$\int \frac{1}{x} \, \mathrm{d}\, x = \ln|x|$

$\int \sin x \, \mathrm{d}\, x = -\cos x$

$\int \sec x \tan x \, \mathrm{d}\, x = \sec x$

$\int \csc x \, \mathrm{d}\, x = -\ln|\csc x + \cot x|$

$\int \frac{1}{1+x^2} \, \mathrm{d}\, x = \arctan x$

$\int \frac{1}{\cosh^2 x} \, \mathrm{d}\, x = \tanh x$

$\int \frac{1}{\sqrt{x^2-1}} \, \mathrm{d}\, x = \operatorname{arcosh} x$

$\int \frac{1}{x\sqrt{1+x^2}} \, \mathrm{d}\, x = -\operatorname{csch}^{-1} x$

$\int e^x \, \mathrm{d}\, x = e^x$

$\int \frac{1}{\cos^2 x} \, \mathrm{d}\, x = \tan x$

$\int \csc x \cot x \, \mathrm{d}\, x = -\csc x$

$\int a^x \, \mathrm{d}\, x = \frac{a^x}{\ln a}$

$\int \cosh x \, \mathrm{d}\, x = \sinh x$

$\int \frac{1}{\sinh^2 x} \, \mathrm{d}\, x = -\coth x$

$\int \frac{1}{x\sqrt{x^2-1}} \, \mathrm{d}\, x = \sec^{-1} x$

$\int \operatorname{sech} x \, \mathrm{d}\, x = \arctan(\sinh x)$

$\int \operatorname{csch} x \, \mathrm{d}\, x = \ln|\tanh(x/2)|$

II. Some Useful Identities

1. Trigonometric Identities

- Reciprocal Identities

$$\sec x = \frac{1}{\cos x} \qquad \csc x = \frac{1}{\sin x} \qquad \cot x = \frac{1}{\tan x} = \frac{\cos x}{\sin x}$$

- Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1 \qquad 1 + \tan^2 x = \sec^2 x \qquad 1 + \cot^2 x = \csc^2 x$$

- Double-Angle Identities

$$\sin 2x = 2 \sin x \cos x \qquad \cos 2x = \cos^2 x - \sin^2 x$$

- Product of sine and cosine

$$\sin ax \sin bx = \frac{1}{2}(\cos(a-b)x - \cos(a+b)x)$$

$$\cos ax \cos bx = \frac{1}{2}(\cos(a-b)x + \cos(a+b)x)$$

$$\sin ax \cos bx = \frac{1}{2}(\sin(a-b)x + \sin(a+b)x)$$

2. Hyperbolic Identities

- Hyperbolic Functions

$$\cosh x = \frac{e^x + e^{-x}}{2} \qquad \sinh x = \frac{e^x - e^{-x}}{2} \qquad \tanh x = \frac{\sinh x}{\cosh x} \qquad \coth x = \frac{1}{\tanh x}$$

$$\operatorname{sech} x = \frac{1}{\cosh x} = \frac{2}{e^x + e^{-x}} \qquad \operatorname{csch} x = \frac{1}{\sinh x} = \frac{2}{e^x - e^{-x}}$$

- Hyperbolic Identities

$$\cosh^2 x - \sinh^2 x = 1 \qquad 1 - \tanh^2 x = \operatorname{sech}^2 x \qquad \coth^2 x - 1 = \operatorname{csch}^2 x$$

$$\cosh 2x = \cosh^2 x + \sinh^2 x \qquad \sinh 2x = 2 \sinh x \cosh x$$

$$\cosh(x + y) = \cosh x \cosh y + \sinh x \sinh y$$

$$\sinh(x + y) = \sinh x \cosh y + \cosh x \sinh y$$