

## Integration Rules

$f(x)$  and  $g(x)$  are functions, and  $a$ ,  $c$ , and  $n$  are real numbers (possibly with the usual restrictions). All formulas should include a  $+C$  at the end.

$$\int 0 \, dx = C \qquad \int k \, dx = kx \qquad \int x^n \, dx = \frac{x^{n+1}}{n+1} \qquad \int \frac{1}{x} \, dx = \ln|x|$$

Constant Multiple Rule:

$$\int cf(x) \, dx = c \int f(x) \, dx$$

Sum Rule:

$$\int f(x) + g(x) \, dx = \int f(x) \, dx + \int g(x) \, dx$$

Difference Rule:

$$\int f(x) - g(x) \, dx = \int f(x) \, dx - \int g(x) \, dx$$

Substitution Rule:

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

Integration by Parts:

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

$$\int e^x \, dx = e^x \qquad \int a^x \, dx = \frac{a^x}{\ln a}$$

$$\begin{aligned} \int \sin x \, dx &= -\cos x & \int \cos x \, dx &= \sin x & \int \sec^2 x \, dx &= \tan x \\ \int \sec x \tan x \, dx &= \sec x & \int \csc x \cot x \, dx &= -\csc x & \int \csc^2 x \, dx &= -\cot x \\ \int \tan x \, dx &= \ln|\sec x| & \int \cot x \, dx &= \ln|\sin x| & \int \sec x \, dx &= \ln|\sec x + \tan x| \\ \int \csc x \, dx &= -\ln|\csc x + \cot x| \end{aligned}$$

$$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \sin^{-1}\left(\frac{x}{a}\right) \qquad \int \frac{1}{a^2 + x^2} \, dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) \qquad \int \frac{1}{x\sqrt{x^2 - a^2}} \, dx = \frac{1}{a} \sec^{-1}\left(\frac{x}{a}\right)$$