Integration

$f(x)$	$\int f(x)\,dx = F(x) + c$	
k, constant	$kx + c$	
x^n, $(n \neq -1)$	$\frac{x^{n+1}}{n+1} + c$	
$x^{-1} = \frac{1}{x}$	$\begin{cases} \ln x + c & x > 0 \\ \ln(-x) + c & x < 0 \end{cases}$	
e^x	$e^x + c$	
$\cos x$	$\sin x + c$	
$\sin x$	$-\cos x + c$	
$\tan x$	$\ln(\sec x) + c$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$
$\sec x$	$\ln(\sec x + \tan x) + c$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$
$\operatorname{cosec} x$	$\ln(\operatorname{cosec} x - \cot x) + c$	$0 < x < \pi$
$\cot x$	$\ln(\sin x) + c$	$0 < x < \pi$
$\cosh x$	$\sinh x + c$	
$\sinh x$	$\cosh x + c$	
$\tanh x$	$\ln \cosh x + c$	
$\coth x$	$\ln \sinh x + c$	$x > 0$
$\frac{1}{x^2+a^2}$	$\frac{1}{a}\tan^{-1}\frac{x}{a} + c$	$a > 0$
$\frac{1}{x^2-a^2}$	$\frac{1}{2a}\ln\frac{x-a}{x+a} + c$	$\lvert x\rvert > a > 0$
$\frac{1}{a^2-x^2}$	$\frac{1}{2a}\ln\frac{a+x}{a-x} + c$	$\lvert x\rvert < a$
$\frac{1}{\sqrt{x^2+a^2}}$	$\sinh^{-1}\frac{x}{a} + c$	$a > 0$
$\frac{1}{\sqrt{x^2-a^2}}$	$\cosh^{-1}\frac{x}{a} + c$	$x \geqslant a > 0$
$\frac{1}{\sqrt{x^2+k}}$	$\ln(x + \sqrt{x^2+k}) + c$	
$\frac{1}{\sqrt{a^2-x^2}}$	$\sin^{-1}\frac{x}{a} + c$	$-a \leqslant x \leqslant a$
$f(ax+b)$	$\frac{1}{a}F(ax+b) + c$	$a \neq 0$
e.g. $\cos(2x-3)$	$\frac{1}{2}\sin(2x-3) + c$	

The linearity rule for integration

$$\int (af(x) + bg(x))\,\mathrm{d}x = a\int f(x)\,\mathrm{d}x \,+\, b\int g(x)\,\mathrm{d}x,$$

$$(a, b \text{ constant})$$

Integration by substitution

$$\int f(u)\frac{\mathrm{d}u}{\mathrm{d}x}\mathrm{d}x = \int f(u)\mathrm{d}u \quad \text{and}$$

$$\int_a^b f(u)\frac{\mathrm{d}u}{\mathrm{d}x}\,\mathrm{d}x = \int_{u(a)}^{u(b)} f(u)\mathrm{d}u$$

Integration by parts

$$\int_a^b u\frac{\mathrm{d}v}{\mathrm{d}x}\mathrm{d}x = [uv]_a^b - \int_a^b \frac{\mathrm{d}u}{\mathrm{d}x}v\,\mathrm{d}x$$

Alternative form:

$$\int_a^b f(x)g(x)\,\mathrm{d}x = \left[f(x)\,\int g(x)\mathrm{d}x\right]_a^b - \int_a^b \frac{\mathrm{d}f}{\mathrm{d}x}\left\{\int g(x)\mathrm{d}x\right\}\mathrm{d}x$$