Integration Rules and Formulas

Properties of the Integral:

(1) $\displaystyle\int_a^b f(x)\,dx = -\int_b^a f(x)\,dx$

(2) $\displaystyle\int_a^a f(x)\,dx = 0$

(3) $\displaystyle\int_a^b k f(x)\,dx = k\int_a^b f(x)\,dx$

(4) $\displaystyle\int_a^b [f(x)+g(x)]\,dx = \int_a^b f(x)\,dx + \int_a^b g(x)\,dx$

(5) $\displaystyle\int_a^b f(x)\,dx = \int_a^c f(x)\,dx + \int_c^b f(x)\,dx \ (a<c<b)$

(6) $\displaystyle\int_a^b F'(x)\,dx = F(b)-F(a)$

(7) $\displaystyle\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$

(8) $\displaystyle\frac{d}{dx}\int_a^{g(x)} f(t)\,dt = f(g(x))\cdot g'(x)$

(9) $\displaystyle\frac{d}{dx}\int_{h(x)}^{g(x)} f(t)\,dt = f(g(x))\cdot g'(x) - f(h(x))\cdot h'(x)$

Integration Formulas:

(1) $\displaystyle\int x^p\,dx = \frac{x^{p+1}}{p+1}+C,\ \ p\neq -1$

(2) $\displaystyle\int \sin(x)\,dx = -\cos(x)+C$

(3) $\displaystyle\int \cos(x)\,dx = \sin(x)+C$

(4) $\displaystyle\int \sec^2(x)\,dx = \tan(x)+C$

(5) $\displaystyle\int \csc^2(x)\,dx = -\cot(x)+C$

(6) $\displaystyle\int \sec(x)\tan(x)\,dx = \sec(x)+C$

(7) $\displaystyle\int \csc(x)\cot(x)\,dx = -\csc(x)+C$

(8) $\displaystyle\int \frac{1}{x}\,dx = \ln\mid x\mid +C$

(9) $\displaystyle\int \tan(x)\,dx = -\ln\mid\cos(x)\mid +C = \ln\mid\sec(x)\mid +C$

(10) $\displaystyle\int \sec(x)\,dx = \ln\mid\sec(x)+\tan(x)\mid +C$

(11) $\displaystyle\int \sinh(x)\,dx = \cosh(x)+C$

(12) $\displaystyle\int \cosh(x)\,dx = \sinh(x)+C$

(13) $\displaystyle\int e^x\,dx = e^x +C$

(14) $\displaystyle\int a^x\,dx = \frac{1}{\ln(a)}a^x +C$

(15) $\displaystyle\int \frac{1}{1+x^2}\,dx = \arctan(x)+C$

(16) $\displaystyle\int \frac{1}{\sqrt{1-x^2}}\,dx = \arcsin(x)+C$

(17) $\displaystyle\int \frac{1}{a^2+u^2}\,du = \frac{1}{a}\arctan\left(\frac{u}{a}\right)+C$

(18) $\displaystyle\int \frac{1}{\sqrt{a^2-u^2}}\,du = \arcsin\left(\frac{u}{a}\right)+C$

(19) $\displaystyle\int \cos^2(u)\,du = \frac{1}{2}u + \frac{1}{2}\sin(u)\cos(u)+C$

(20) $\displaystyle\int \sin^2(u)\,du = \frac{1}{2}u - \frac{1}{2}\sin(u)\cos(u)+C$