Indefinite Integrals – Some basic forms

[Constants of integration are omitted, a and b are real constants]

$$\int a\, dx = ax$$

$$\int a\ f(x)\, dx = a\int f(x)\, dx$$

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

$\int udv = uv - \int vdu$, where u and v are functions of x (Integration by parts)

$\int x^a dx = \dfrac{x^{a+1}}{a+1}$, where $a \neq -1$ and $\int x^{-1} dx = ln(x)$

$\int e^{ax} dx = \dfrac{e^{ax}}{a}$ and $\int b^{ax} dx = \dfrac{b^{ax}}{a ln(b)}$, where $a \neq 0, b > 0$

Mathematical Results

[a, b and r are real numbers and n is a positive integer]

Binomial expansion: $(a+b)^n = \sum_{i=0}^{n} \binom{n}{i} a^i b^{n-i}$

Summing geometric series (finite): $a + ar + ar^2 + ... + ar^n = \sum_{i=0}^{n} ar^i = \dfrac{a(1-r^{n+1})}{1-r}$, where $r \neq 1$

Summing geometric series (infinite): $a + ar + ar^2 + ... = \sum_{i=0}^{\infty} ar^i = \dfrac{a}{1-r}$, where $|r| < 1$

Series expansion of e^a : $e^a = 1 + a + \dfrac{a^2}{2!} + \dfrac{a^3}{3!} + ... = \sum_{i=0}^{\infty} \dfrac{a^i}{i!}$

Normal integral: $\int_{-\infty}^{+\infty} e^{-\frac{(x-a)^2}{2b^2}} dx = b\sqrt{2\pi}$, $b > 0$

Gamma integral: $\int_{0}^{+\infty} x^{a-1} e^{-\frac{x}{b}} dx = \Gamma(a) b^a$, $a > 0, b > 0$

Beta integral: $\int_{0}^{1} x^{a-1} (1-x)^{b-1} dx = \dfrac{\Gamma(a)\Gamma(b)}{\Gamma(a+b)}$, $a > 0$, $b > 0$