Some possibly useful formulas

$$V = \int A(x)dx \qquad V = \int \pi r^2 dx \qquad V = \int 2\pi r h\, dr \qquad W = \int F\, dx$$

$$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n, \quad |x| < 1 \qquad e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}, \quad \text{all } x$$

$$\ln(1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n} x^n, \quad |x| < 1 \qquad \sin x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1}, \quad \text{all } x$$

$$\arctan x = \sum_{n=0}^{\infty} (-1)^n x^{2n+1}, \quad |x| < 1 \qquad \cos x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!} x^{2n}, \quad \text{all } x$$

$$\text{integrand in } \sqrt[n]{ax+b} \; : \; x = \frac{u^n - b}{a} \qquad \sin^2 A = \frac{1}{2}(1 - \cos 2A)$$

$$\text{integrand in } e^x \; : \; u = e^x \qquad \cos^2 A = \frac{1}{2}(1 + \cos 2A)$$

$$\text{integrand in } a^2 - x^2 \; : \; x = a\sin\theta \qquad \int \frac{dx}{\sqrt{a^2 - x^2}} = \arcsin\left(\frac{x}{a}\right) + C$$

$$\text{integrand in } x^2 + a^2 \; : \; x = a\tan\theta \qquad \int \frac{dx}{x^2 + a^2} = \frac{1}{a}\arctan\left(\frac{x}{a}\right) + C$$

$$\text{integrand in } x^2 - a^2 \; : \; x = a\sec\theta \qquad \int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a}\operatorname{arcsec}\left(\frac{x}{a}\right) + C$$

$$\int u\, dv = uv - \int v\, du \qquad (\overline{x}, \overline{y}) = \left(\frac{\int x(f(x) - g(x))dx}{\text{area}}, \frac{\int \frac{1}{2}(f(x)^2 - g(x)^2)dx}{\text{area}} \right)$$

$$\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{dy}{dx}\right)}{\frac{dx}{dt}} \qquad s = \int_a^b \sqrt{(x'(t))^2 + (y'(t))^2}\, dt \qquad \sum_{n=0}^{\infty} \frac{1}{n!} f^{(n)}(a)(x-a)^n$$

$$\sum a_n \text{ converges if } \lim_{n\to\infty} \sqrt[n]{|a_n|} < 1 \text{ or } \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| < 1.$$

$$a_n, b_n > 0, \lim_{n\to\infty} \frac{a_n}{b_n} \neq 0, \infty : \sum a_n \text{ converges } \iff \sum b_n \text{ converges}$$

$$\sum \frac{1}{n^p} \text{ converges } \Leftrightarrow p > 1 \qquad |r| < 1 : \sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}$$

$$a_n \text{ decr, } \lim a_n = 0 : \sum (-1)^n a_n \text{ converges; and } \left| \sum^{\infty} (-1)^n a_n - \sum^{N} (-1)^n a_n \right| < a_{N+1}$$

$$(x_{n+1}, y_{n+1}) = (x_n + h, y_n + f(x_n, y_n)h) \qquad T_n = \frac{h}{2}[f(a) + 2f(x_1) + \ldots + 2f(x_{n-1} + f(b)]$$

$$M_n = h[f(x_1^*) + \ldots + f(x_n^*)] \qquad S_n = \frac{h}{3}[f(a) + 4f(x_1) + 2f(x_2) + \ldots + 4f(x_{n-1}) + f(b)]$$