Linear first order differential equations:

$y' + py = q, y = \frac{1}{v}\int vq\,dx$, where $v = e^{\int p\,dx}$

Limits:

$\lim_{n\to\infty} x^{\frac{1}{n}} = 1$ for $x > 0$

$\lim_{n\to\infty} n^{\frac{1}{n}} = 1$

$\lim_{n\to\infty} \left(1 + \frac{x}{n}\right)^n = e^x$

$\lim_{n\to\infty} \frac{x^n}{n!} = 0$

Taylor series:

$f(x) = \sum_{k=0}^{n} \frac{f^{(k)}(c)}{k!}(x-c)^k + \frac{f^{(n+1)}(c^*)}{(n+1)!}(x-c)^{n+1}$ for some c^* between c and x

Geometric series $\frac{1}{1-x} = \sum_{k=0}^{\infty} x^k$

Binomial series $(1+x)^r = \sum_{k=0}^{\infty} \frac{r(r-1)...(r-k+1)}{k!}x^k$

$$e^x = \sum_{k=0}^{\infty} \frac{1}{k!}x^k$$

$$\sinh x = \sum_{n=0}^{\infty} \frac{1}{(2n+1)!}x^{2n+1}$$

$$\cosh x = \sum_{n=0}^{\infty} \frac{1}{(2n)!}x^{2n}$$

$$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}x^{2n+1}$$

$$\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!}x^{2n}$$

Fourier series:

Given piecewise continuous $f(t)$ on an interval $[c-L, c+L]$ centered at c, at points of continuity

$$f(t) = a_0 + \sum_{n=1}^{\infty} \left[a_n \cos\frac{n\pi t}{L} + b_n \sin\frac{n\pi t}{L}\right]$$

where

a_0 is the average of f on the interval and for $n \geq 1$

$$a_n = \frac{1}{L}\int_{c-L}^{c+L} f(t)\cos\frac{n\pi t}{L}\,dt$$

$$b_n = \frac{1}{L}\int_{c-L}^{c+L} f(t)\sin\frac{n\pi t}{L}\,dt$$