Formula Sheet - MA 16020 Exam 3

Geometric Series:

The geometric series $\sum\limits_{n=0}^{\infty} ar^n$ with common ratio r converges if $|r| < 1$ with the sum

$$S = \sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}$$

Power Series/Maclaurin Series:

$$
\begin{aligned}
\frac{1}{1-x} &= \sum_{n=0}^{\infty} x^n, |x| < 1 = 1 + x + x^2 + x^3 + \dots \\
e^x &= \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots \\
\sin x &= \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!} = \frac{x}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots \\
\cos x &= \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots \\
\ln(1+x) &= \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n} = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots
\end{aligned}
$$