MACLAURIN SERIES TO LEARN

1) $\frac{1}{1-x} = 1 + x + x^2 + x^3 \ldots \quad (-1 < x < 1)$

Note: This is a geometric series. Recall $\frac{a}{1-r} = a + ar + ar^2 + ar^3 + \ldots$

If $|r| < 1$ Let $a = 1$, and $r = x$

2) $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots$ (all x) This involves all powers (starting with $1 = x^0$), positive signs and factorials.

3) $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots$ (all x). This involves odd powers, alternating signs, and factorials.

4) $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots$ (all x). This involves even powers (starting with $1 = x^o$), alternating signs, and factorials.

5) Binomials Series:

$(1+x)^m = 1 + mx + \frac{m(m-1)}{2!}x^2 + \frac{m(m-1)(m-2)}{3!}x^3 + \ldots$

Notice the pattern. This holds if $|x| < 1$. But when m is a positive integer, we get the binomial theorem which holds for all x.