Hyperbolic Formulas

① $\cosh^2 x - \sinh^2 x = 1$

② $\cosh^2 x + \sinh^2 x = \cosh 2x$

Adding ① and ②

③ $2\cosh^2 x = 1 + \cosh 2x$

Subtracting ② from ①

④ $2\sinh^2 x = \cosh 2x - 1$

$$1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$$

$$1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots = \frac{\pi^2}{6}$$

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

$$\ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \dots$$

$$\ln(1 - x) = -x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \frac{x^5}{5} - \dots$$

$$\text{Cos } x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \dots$$

$$\text{Sin } x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \dots$$

nth order derivatives

$$\frac{d^n}{dx^n}\sin(ax+b) = a^n \sin\left[n\frac{\pi}{2} + ax + b\right]$$

$$\frac{d^n}{dx^n}\cos(ax+b) = a^n \cos\left[n\frac{\pi}{2} + ax + b\right]$$

$$\frac{d^n}{dx^n} a^x = a^x (\ln a)^n$$

$$\frac{d^n}{dx^n} e^{ax} = a^n e^{ax}$$

$$\frac{d^n}{dx^n}\left[\frac{1}{ax+b}\right] = \frac{a^n (-1)^n n!}{(ax+b)^{n+1}}$$

$$\frac{d^n}{dx^n} e^{ax}\sin(bx+c) = [a^2 + b^2]^{\frac{n}{2}} e^{ax} \sin(bx + c + n\tan^{-1}\frac{b}{a})$$

$$\frac{d^n}{dx^n} e^{ax}\cos(bx+c) = [a^2 + b^2]^{\frac{n}{2}} e^{ax} \cos(bx + c + n\tan^{-1}\frac{b}{a})$$

$\tan^{-1} z = \frac{1}{2}\cos^{-1}\left(\frac{1 - z^2}{1 + z^2}\right)$	$\tanh^{-1} z = \frac{1}{2}\cosh^{-1}\left(\frac{1 + z^2}{1 - z^2}\right)$

$$\int \frac{dx}{a + b\cos x} = \frac{1}{\sqrt{a^2 - b^2}}\cos^{-1}\left(\frac{b + a\cos x}{a + b\cos x}\right) + c \quad , a > b$$

$$\int \frac{dx}{a + b\cos x} = \frac{1}{\sqrt{b^2 - a^2}}\cosh^{-1}\left(\frac{b + a\cos x}{a + b\cos x}\right) + c \quad , a < b$$

$$\int \frac{dx}{a + b\cos x} = \frac{1}{a}\tan\frac{x}{2} + c \quad , a = b$$

MansoorTahir827@gmail.com