# Using LATEX for Mathematical Typing

Souvik Chakraborty

2021-11-27

West Bengal State University
Department of Physics
Semester 1
Formula Sheet

# 1   Quadratic Formula:

for any quadratic eqn.

$$ax^2 + bx + c = 0$$

we get the solution for x :

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

# 2   Trigonometric functions:

**2.1**   $\sin^2 \theta + \cos^2 \theta = 1$

**2.2**   $\tan^2 \theta - \sec^2 \theta = 1$

**2.3**   $\csc^2 \theta - \cot^2 \theta = 1$

**2.4**   $\cos^2 \theta - \sin^2 \theta = \cos 2\theta$

**2.5**   $\sin \left( \frac{\pi}{2} - \theta \right) = \cos \theta$

**2.6**   $\dfrac{\sin \alpha}{a} = \dfrac{\sin \beta}{b} = \dfrac{\sin \gamma}{c}$

# 3   Logarithmic :

**3.1**   $\log_a xy = \log_a x + \log_a y$

**3.2**   $\log_a \dfrac{x}{y} = \log_a x - \log_a y$

**3.3**   $\log_a x^n = n \log_a x$

**3.4**   $\log_a x = \dfrac{\log_b x}{\log_b a}$

# 4   Fibonacci series:

$$F_n = F_{n-1} + F_{n-2}$$

# 5 Limit:

**5.1** $f(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

**5.2** $\prod_{i=1}^{n} i = n!$

# 6 Integrations :

**6.1** $\int x^n dx = \frac{x^{n+1}}{n+1} + C$

**6.2** $\int e^x dx = e^x + C$

**6.3** $\int a^x dx = \frac{a^x}{\log a} + C$

**6.4** $\int \cos x \, dx = \sin x + C$

**6.5** $\int \sin x \, dx = -\cos x + C$

**6.6** $\int \sec^2 x \, dx = \tan x + C$

**6.7** $\int \csc^2 x \, dx = -\cot x + C$

**6.8** $\int \sec x \tan x \, dx = \sec x + C$

**6.9** $\int \csc x \cot x \, dx = -\csc x + C$

**6.10** $\int \frac{1}{\sqrt{a^2 - x^2}} dx = \sin^{-1} \frac{x}{a} + C$

**6.11** $\int \frac{1}{x^2 + 1} dx = \tan^{-1} x + C$

**6.12** $\int \frac{1}{x^2 + a^2} dx = \frac{1}{a} \tan^{-1} \frac{x}{a} + C$

**6.13** $\int \frac{1}{x\sqrt{x^2 - a^2}} dx = \frac{1}{a} \sec^{-1} \frac{x}{a} + C; (x^2 > a^2)$

# 7 Series:

**7.1** $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$

**7.2** $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

**7.3** $\sum_{i=1}^{n} (2i - 1) = n^2$

**7.4** $\sum_{i=1}^{n} i(i+1) = \frac{n(n+1)(n+2)}{3}$

**7.5** $\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$

# 8 Derivation:

**8.1** $\frac{d}{dx} x^n = n x^{n-1}$

**8.2** $\frac{d}{dx} \log x = \frac{1}{x}$

**8.3** $\frac{d}{dx} \sin x = \cos x$