

**Miscellaneous Formulae**

1. Acceleration due to gravity:  $9.8 \text{ m/s}^2$  or  $32 \text{ ft/s}^2$
2. Area of a trapezoid:  $\frac{h}{2}(b_1 + b_2)$
3. Volume of a cylinder:  $\pi r^2 h$

**Summation Formulae**

4.  $\sum_{i=1}^n c = cn$
5.  $\sum_{i=1}^n i = \frac{n(n+1)}{2}$
6.  $\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$
7.  $\sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4}$

**Arc Length and Surface Area**

8. The arc length of  $f(x)$  from  $x = a$  to  $x = b$  is  $\int_a^b \sqrt{1 + [f'(x)]^2} dx$
9. The surface area of the surface obtained by revolving  $f(x)$  from  $x = a$  to  $x = b$  about the  $x$ -axis is  $\int_a^b 2\pi f(x) \sqrt{1 + [f'(x)]^2} dx$

**Inverse Trigonometric Functions**

10.  $\frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$
11.  $\frac{d}{dx}(\arccos x) = \frac{-1}{\sqrt{1-x^2}}$
12.  $\frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$
13.  $\frac{d}{dx}(\operatorname{arcsec} x) = \frac{1}{|x|\sqrt{x^2-1}}$
14.  $\frac{d}{dx}(\operatorname{arccsc} x) = \frac{-1}{|x|\sqrt{x^2-1}}$
15.  $\frac{d}{dx}(\operatorname{arccot} x) = \frac{-1}{1+x^2}$
16.  $\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\left(\frac{x}{a}\right) + C$
17.  $\int \frac{dx}{a^2+x^2} = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C$
18.  $\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a} \operatorname{arcsec}\left(\frac{|x|}{a}\right) + C$

**Hyperbolic Functions**

19.  $\sinh x = \frac{e^x - e^{-x}}{2}$
20.  $\cosh x = \frac{e^x + e^{-x}}{2}$
21.  $\tanh x = \frac{\sinh x}{\cosh x}$
22.  $\operatorname{csch} x = \frac{1}{\sinh x}$

23.  $\operatorname{sech} x = \frac{1}{\cosh x}$

24.  $\operatorname{coth} x = \frac{\cosh x}{\sinh x}$

25.  $\cosh^2 x - \sinh^2 x = 1$

26.  $\frac{d}{dx}(\sinh x) = \cosh x$

27.  $\frac{d}{dx}(\cosh x) = \sinh x$

28.  $\frac{d}{dx}(\tanh x) = (\operatorname{sech} x)^2$

29.  $\frac{d}{dx}(\operatorname{coth} x) = -(\operatorname{csch} x)^2$

30.  $\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$

31.  $\frac{d}{dx}(\operatorname{csch} x) = -\operatorname{csch} x \operatorname{coth} x$

32.  $\int \sinh x \, dx = \cosh x + C$

33.  $\int \cosh x \, dx = \sinh x + C$

### Inverse Hyperbolic Functions

34.  $\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1})$

35.  $\cosh^{-1} x = \ln(x + \sqrt{x^2 - 1}), x \geq 1$

36.  $\tanh^{-1} x = \frac{1}{2} \ln \left( \frac{1+x}{1-x} \right), -1 < x < 1$

37.  $\frac{d}{dx}(\sinh^{-1} x) = \frac{1}{\sqrt{x^2 + 1}}$

38.  $\frac{d}{dx}(\cosh^{-1} x) = \frac{1}{\sqrt{x^2 - 1}}, x > 1$

39.  $\frac{d}{dx}(\tanh^{-1} x) = \frac{1}{1-x^2}, -1 < x < 1$

40.  $\frac{d}{dx}(\operatorname{csch}^{-1} x) = -\frac{1}{|x|\sqrt{1+x^2}}, x \neq 0$

41.  $\frac{d}{dx}(\operatorname{sech}^{-1} x) = -\frac{1}{x\sqrt{1-x^2}}, 0 < x < 1$

42.  $\frac{d}{dx}(\operatorname{coth}^{-1} x) = \frac{1}{1-x^2}, -1 < x, x > 1$

### Trigonometric Identities

43.  $\csc x = \frac{1}{\sin x}$

44.  $\sec x = \frac{1}{\cos x}$

45.  $\cot x = \frac{1}{\tan x}$

46.  $\sin^2 x + \cos^2 x = 1$

47.  $1 + \tan^2 x = \sec^2 x$

48.  $1 + \cot^2 x = \csc^2 x$

49.  $\sin^2 x = \frac{1 - \cos(2x)}{2}$

50.  $\cos^2 x = \frac{1 + \cos(2x)}{2}$

51.  $\tan^2 x = \frac{1 - \cos(2x)}{1 + \cos(2x)}$

52.  $\sin x \sin y = \frac{1}{2}(\cos(x-y) - \cos(x+y))$

53.  $\cos x \cos y = \frac{1}{2}(\cos(x-y) + \cos(x+y))$

54.  $\sin x \cos y = \frac{1}{2}(\sin(x+y) + \sin(x-y))$