

Mathematics revision sheet for class 11 and  
class 12 physics

April 9, 2012

**Trigonometry** Properties of trigonometric functions

*1. Pythagorean identity*

$$\sin^2 A + \cos^2 A = 1$$

$$1 + \tan^2 A = \sec^2 A$$

$$1 + \cot^2 A = \operatorname{cosec}^2 A$$

*2. Periodic function*

$$\sin(A + 2\pi) = \sin A$$

$$\cos(A + 2\pi) = \cos A$$

*3. Even-Odd Identities*

$$\cos(-A) = \cos(A)$$

$$\sin(-A) = -\sin(A)$$

$$\tan(-A) = -\tan(A)$$

$$\operatorname{cosec}(-A) = -\operatorname{cosec}(A)$$

$$\sec(-A) = \sec(A)$$

$$\cot(-A) = -\cot(A)$$

*4. Quotient identities*  $\tan(A) = \frac{\sin A}{\cos A}$

$$\cot(A) = \frac{\cos A}{\sin A}$$

*5. Co-function identities*

$$\sin\left(\frac{\pi}{2} - A\right) = \cos(A)$$

$$\cos\left(\frac{\pi}{2} - A\right) = \sin(A)$$

$$\tan\left(\frac{\pi}{2} - A\right) = \cot(A)$$

$$\operatorname{cosec}\left(\frac{\pi}{2} - A\right) = \sec(A)$$

$$\sec\left(\frac{\pi}{2} - A\right) = \operatorname{cosec}(A)$$

$$\cot\left(\frac{\pi}{2} - A\right) = \tan(A)$$

*6. Sum difference formulas*

$$\sin(A \pm B) = \sin(A)\cos(B) \pm \sin(B)\cos(A)$$

$$\cos(A \pm B) = \cos(A)\cos(B) \mp \sin(A)\sin(B)$$

$$\tan(A \pm B) = \frac{\tan(A) \pm \tan(B)}{1 \mp \tan(A)\tan(B)}$$

*7. Double angle formulas*

$$\cos(2A) = \cos^2(A) - \sin^2(A) = 2\cos^2(A) - 1 = 1 - 2\sin^2(A)$$

$$\sin(2A) = 2\sin(A)\cos(A)$$

$$\tan(2A) = \frac{2\tan(A)}{1 - \tan^2(A)}$$

*8. Product to sum formulas*

$$\sin(A)\cos(B) = \frac{1}{2}[\cos(A - B) - \cos(A + B)]$$

$$\cos(A)\cos(B) = \frac{1}{2}[\cos(A - B) + \cos(A + B)]$$

$$\sin(A)\sin(B) = \frac{1}{2}[\sin(A + B) - \sin(A - B)]$$

$$\cos(A)\sin(B) = \frac{1}{2}[\sin(A+B) - \sin(A-B)]$$

### 9. Power reducing formulas

$$\sin^2 A = \frac{1 - \cos(2A)}{2}$$

$$\cos^2 A = \frac{1 + \cos(2A)}{2}$$

$$\tan^2 A = \frac{1 - \cos(2A)}{1 + \cos(2A)}$$

### 10. reciprocal identities

$$\operatorname{Cosec}(A) = \frac{1}{\sin(A)}$$

$$\operatorname{Sec}(A) = \frac{1}{\cos(A)}$$

$$\operatorname{Tan}(A) = \frac{1}{\cot(A)}$$

$$\operatorname{Cosec}(A) = \frac{1}{\sin(A)}$$

$$\operatorname{Sec}(A) = \frac{1}{\cos(A)}$$

$$\operatorname{Cot}(A) = \frac{1}{\tan(A)}$$

### Binomial Theorem

$(a + b)^n = C_0^n a^n + C_1^n a^{n-1}b + C_2^n a^{n-2}b^2 + \dots + C_n^n b^n$  From the binomial formula, if we let  $a = 1$  and  $b = x$ , we can also obtain the binomial series which is valid for any real number  $n$  if  $|x| < 1$ .

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \dots$$

### Geometric Series

$a, aq, aq^2, aq^3, aq^4, \dots, aq^{n-1}$  where  $q$  is not equal to 0,  $q$  is the common ratio and  $a$  is a scale factor. Formula for the sum of the first  $n$  numbers of geometric progression  $S_n = \frac{a(1-q^n)}{(1-q)}$

*Infinite geometric series where  $|q| < 1$*  If  $|q| < 1$  then  $a_n \rightarrow 0$ , when  $n$  goes to infinity So the sum  $S$  of such a infinite geometric progression is:

$S = \frac{1}{(1-x)}$  which is valid only for  $|x|$

**Arithmetic Progression**  $a, a + d, a + 2d, a + 3d, \dots, a + (n - 1)d$  The sum  $S$  of the first  $n$  values of a finite sequence is given by the formula:

$$S = \frac{n}{2}[(2a + d(n - 1))]$$

**Quadratic Formula**  $ax^2 + bx + c = 0$  then  $x = -\frac{b \pm \sqrt{b^2 - 4ac}}{2a}$

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