A SUMMARY OF BASIC IDENTITIES AND FORMULAE

Pythagorean Identities:

$\sin^2\theta + \cos^2\theta = 1$ $\quad$ $1 + \tan^2\theta = \sec^2\theta$ $\quad$ $1 + \cot^2\theta = \csc^2\theta$

Reciprocal and Quotient Identities:

$\sec\theta = \frac{1}{\cos\theta}$ $\quad$ $\csc\theta = \frac{1}{\sin\theta}$ $\quad$ $\cot\theta = \frac{1}{\tan\theta}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\quad$ $\cot\theta = \frac{\cos\theta}{\sin\theta}$

Addition Identities:

$\cos(x+y) = \cos x\cos y - \sin x\sin y$ $\quad$ $\sin(x+y) = \sin x\cos y + \cos x\sin y$

$\cos(x-y) = \cos x\cos y + \sin x\sin y$ $\quad$ $\sin(x-y) = \sin x\cos y - \cos x\sin y$

Double Angle Identities:

$$\begin{aligned}\cos 2\theta &= \cos^2\theta - \sin^2\theta \\ &= 2\cos^2\theta - 1 \\ &= 1 - 2\sin^2\theta\end{aligned}$$

$\sin 2\theta = 2\sin\theta\cos\theta$

Combinations:

${}_nP_r = \frac{n!}{(n-r)!}$ $\quad$ ${}_nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$ $\quad$ $t_{k+1} = {}_nC_k\, a^{n-k} b^k$

Useful Trigonometry Facts

- amplitude $= \frac{M-m}{2}$
- vertical displacement $= \frac{M+m}{2}$
- period $= \frac{2\pi}{b}$ for $y = \sin bx$ and $y = \cos bx$
- period $= \frac{\pi}{b}$ for $y = \tan bx$
- a=rθ
- $\pi = 180^\circ$