

Unit 1 Formulas

Area of a sector: $A = (1/2)r^2\theta$ Arc length: $s = r\theta$ Angular velocity: $\omega = \theta/t$ Linear velocity: $v = s/t$ or $v = r\omega$
 Remember: θ must be in radians in all of these (including ω)

Reciprocal identities

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

Tangent/Cotangent Identities

$\frac{\sin \theta}{\cos \theta} = \tan \theta$	$\frac{\cos \theta}{\sin \theta} = \cot \theta$
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Cofunction identities

If A and B are complimentary:

$$\sin A = \cos B \qquad \tan A = \cot B \qquad \sec A = \csc B$$

Written another way:

$$\begin{aligned} \sin \theta &= \cos (\pi/2 - \theta) & \tan \theta &= \cot (\pi/2 - \theta) & \sec \theta &= \csc (\pi/2 - \theta) \\ \cos \theta &= \sin (\pi/2 - \theta) & \cot \theta &= \tan (\pi/2 - \theta) & \csc \theta &= \sec (\pi/2 - \theta) \end{aligned}$$

Sum and difference formulas

$$\cos (A+B) = \cos A \cos B - \sin A \sin B \qquad \sin (A+B) = \sin A \cos B + \cos A \sin B$$

$$\cos (A-B) = \cos A \cos B + \sin A \sin B \qquad \sin (A-B) = \sin A \cos B - \cos A \sin B$$

$$\begin{aligned} \tan(A + B) &= \frac{\tan A + \tan B}{1 - \tan A \tan B} \\ \tan(A - B) &= \frac{\tan A - \tan B}{1 + \tan A \tan B} \end{aligned}$$

Double angle formulas (note: each of these is easy to derive from the sum formulas letting both $A=\theta$ and $B=\theta$)

$$\cos 2\theta = \cos^2\theta - \sin^2\theta \qquad \sin 2\theta = 2\cos \theta \sin \theta \qquad \tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

Half-angle formulas

$$\cos \frac{\theta}{2} = \pm \sqrt{\frac{1 + \cos \theta}{2}} \qquad \sin \frac{\theta}{2} = \pm \sqrt{\frac{1 - \cos \theta}{2}} \qquad \tan \frac{\theta}{2} = \frac{\sin \theta}{1 + \cos \theta} \text{ or } \frac{1 - \cos \theta}{\sin \theta}$$

Pythagorean Identities

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

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

$$\cot^2\theta + 1 = \csc^2\theta$$

Even/Odd Identities

$$\cos(-\theta) = \cos \theta$$

$$\sin(-\theta) = -\sin \theta$$

$$\tan(-\theta) = -\tan \theta$$

$$\sec(-\theta) = \sec \theta$$

$$\csc(-\theta) = -\csc \theta$$

$$\cot(-\theta) = -\cot \theta$$

Also helpful:

$$\sin^2(-\theta) = \sin^2 \theta$$

$$\cos^2(-\theta) = \cos^2 \theta$$

$$\tan^2(-\theta) = \tan^2 \theta$$

$$\csc^2(-\theta) = \csc^2 \theta$$

$$\sec^2(-\theta) = \sec^2 \theta$$

$$\cot^2(-\theta) = \cot^2 \theta$$

$$\sin(2\pi*n + \theta) = \sin \theta \text{ for any integer value of } n$$

$$\cos(2\pi*n + \theta) = \cos \theta \text{ for any integer value of } n$$

$$\tan(\pi*n + \theta) = \tan \theta \text{ for any integer value of } n$$