

TRIG IDENTITIES

Sum and Difference formulas

$$\begin{aligned}(1) \quad \cos(a - b) &= \cos(a)\cos(b) + \sin(a)\sin(b) \\ \cos(a + b) &= \cos(a)\cos(b) - \sin(a)\sin(b) \\ (2) \quad \sin(a - b) &= \sin(a)\cos(b) - \cos(a)\sin(b) \\ \sin(a + b) &= \sin(a)\cos(b) + \cos(a)\sin(b) \\ (3) \quad \tan(a - b) &= \frac{\tan(a) - \tan(b)}{1 + \tan(a)\tan(b)} \\ \tan(a + b) &= \frac{\tan(a) + \tan(b)}{1 - \tan(a)\tan(b)}\end{aligned}$$

Double Angle Identities

$$\begin{aligned}(1) \quad \sin(2x) &= 2\cos(x)\sin(x) \\ \sin(x) &= 2\cos\left(\frac{x}{2}\right)\sin\left(\frac{x}{2}\right) \\ (2) \quad \cos^2(x) &= \frac{1 + \cos(2x)}{2} \\ \cos^2\left(\frac{x}{2}\right) &= \frac{1 + \cos(x)}{2} \\ \cos(2x) &= 2\cos^2(x) - 1 \\ (3) \quad \sin^2(x) &= \frac{1 - \cos(2x)}{2} \\ \sin^2\left(\frac{x}{2}\right) &= \frac{1 - \cos(x)}{2} \\ \cos(2x) &= 1 - 2\sin^2(x) \\ (4) \quad \tan(2x) &= \frac{2\tan(x)}{1 - \tan^2(x)} \\ \tan(x) &= \frac{2\tan\left(\frac{x}{2}\right)}{1 - \tan^2\left(\frac{x}{2}\right)}\end{aligned}$$

Product to Sum Identities

$$\begin{aligned}(1) \quad \sin(a)\sin(b) &= \frac{1}{2}(\cos(a - b) - \cos(a + b)) \\ (2) \quad \cos(a)\cos(b) &= \frac{1}{2}(\cos(a - b) + \cos(a + b)) \\ (3) \quad \sin(a)\cos(b) &= \frac{1}{2}(\sin(a + b) + \sin(a - b))\end{aligned}$$