

Trigonometric Identities

The blue Formulas are the ones we use most in this class

- **Pythagorean Identities**

- * $\sin^2(\alpha) + \cos^2(\alpha) = 1$
- * $\tan^2(\alpha) + 1 = \sec^2(\alpha)$
- * $\cot^2(\alpha) + 1 = \csc^2(\alpha)$

- **Reflection Formulas**

- * $\sin(-\alpha) = -\sin(\alpha)$
- * $\cos(-\alpha) = \cos(\alpha)$
- * $\tan(-\alpha) = -\tan(\alpha)$
- * $\cot(-\alpha) = -\cot(\alpha)$

- **Periodic Formulas:**

- * $\sin(\alpha + 2\pi) = \sin(\alpha)$.
- * $\cos(\alpha + 2\pi) = \cos(\alpha)$.
- * $\tan(\alpha + 2\pi) = \tan(\alpha)$.
- * $\cot(\alpha + 2\pi) = \cot(\alpha)$.

- **π translation Formulas:**

- * $\sin(\pi + \alpha) = -\sin(\alpha)$.
- * $\sin(\pi - \alpha) = \sin(\alpha)$.
- * $\cos(\pi + \alpha) = -\cos(\alpha)$.
- * $\cos(\pi - \alpha) = -\cos(\alpha)$.
- * $\tan(\pi + \alpha) = \tan(\alpha)$.
- * $\tan(\pi - \alpha) = -\tan(\alpha)$.
- * $\cot(\pi + \alpha) = \cot(\alpha)$.
- * $\cot(\pi - \alpha) = -\cot(\alpha)$.

- **$\frac{\pi}{2}$ translation Formulas:**

- * $\sin(\pi/2 + \alpha) = \cos(\alpha)$.
- * $\sin(\pi/2 - \alpha) = \cos(\alpha)$.
- * $\cos(\pi/2 + \alpha) = -\sin(\alpha)$.
- * $\cos(\pi/2 - \alpha) = \sin(\alpha)$.

- **Double angle Formulas**

- * $\sin(2\alpha) = 2\sin(\alpha)\cos(\alpha)$
- * $\cos(2\alpha) = \cos^2(\alpha) - \sin^2(\alpha)$
OR $\cos(2\alpha) = 1 - 2\sin^2(\alpha)$
OR $\cos(2\alpha) = 2\cos^2(\alpha) - 1$
- * $\cos^2(\alpha) = \frac{\cos(2\alpha) + 1}{2}$
- * $\sin^2(\alpha) = \frac{1 - \cos(2\alpha)}{2}$

- **Sum and Difference Formulas**

- * $\sin(\alpha + \beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta)$
- * $\sin(\alpha - \beta) = \sin(\alpha)\cos(\beta) - \cos(\alpha)\sin(\beta)$
- * $\cos(\alpha + \beta) = \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta)$
- * $\cos(\alpha - \beta) = \cos(\alpha)\cos(\beta) + \sin(\alpha)\sin(\beta)$

- **Product to Sum Formulas**

- * $\sin(\alpha)\sin(\beta) = \frac{1}{2}(\cos(\alpha - \beta) - \cos(\alpha + \beta))$
- * $\cos(\alpha)\cos(\beta) = \frac{1}{2}(\cos(\alpha - \beta) + \cos(\alpha + \beta))$
- * $\sin(\alpha)\cos(\beta) = \frac{1}{2}(\sin(\alpha + \beta) + \sin(\alpha - \beta))$