

DOUBLE ANGLE FORMULAS

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

$$\sin(2\alpha) = \sin(\alpha + \alpha) = \sin\alpha \cos\alpha + \cos\alpha \sin\alpha$$

$$\boxed{\sin(2\alpha) = 2 \sin\alpha \cos\alpha}$$

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

$$\cos(2\alpha) = \cos(\alpha + \alpha) = \cos\alpha \cos\alpha - \sin\alpha \sin\alpha$$

$$\boxed{\cos(2\alpha) = \cos^2\alpha - \sin^2\alpha}$$

$$\sin^2\alpha + \cos^2\alpha = 1 \Rightarrow \sin^2\alpha = 1 - \cos^2\alpha$$

$$\cos(2\alpha) = \cos^2\alpha - (1 - \cos^2\alpha)$$

$$\boxed{\cos(2\alpha) = 2\cos^2\alpha - 1}$$

$$\sin^2\alpha + \cos^2\alpha = 1 \Rightarrow \cos^2\alpha = 1 - \sin^2\alpha$$

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

$$\boxed{\cos(2\alpha) = 1 - 2\sin^2\alpha}$$

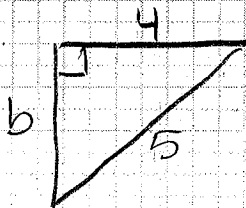
$$\tan(\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

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

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

EX:  $\cos \alpha = -\frac{4}{5}$        $\pi < \alpha < \frac{3\pi}{2}$

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

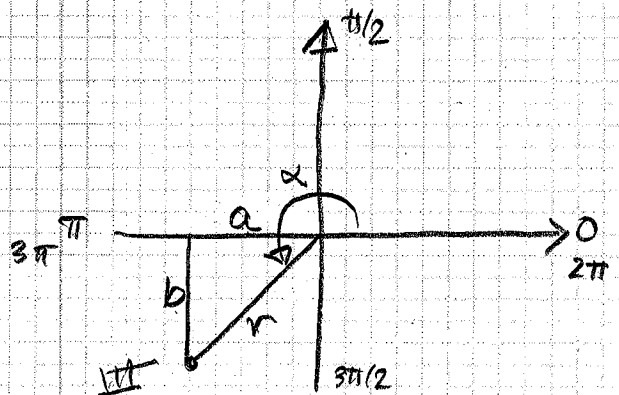


$$b^2 + 4^2 = 5^2$$

$$b^2 = 5^2 - 4^2 = 25 - 16 = 9$$

$$b^2 = 3^2 \Rightarrow b = -3$$

$$\sin \alpha = \frac{-3}{5}$$



$$\cos \alpha = \frac{a}{r} = \frac{-4}{5}$$

$$\sin \alpha = \frac{b}{r} = \frac{-3}{5}$$

$$\sin(2\alpha) = 2 \left( -\frac{3}{5} \right) \left( -\frac{4}{5} \right) = \frac{24}{25}$$

$$\pi < \alpha < \frac{3\pi}{2}$$

$$2\pi < 2\alpha < 3\pi$$

$$\cos(2\alpha) = 2 \cos^2 \alpha - 1 = 2 \left( -\frac{4}{5} \right)^2 - 1 = \frac{7}{25}$$

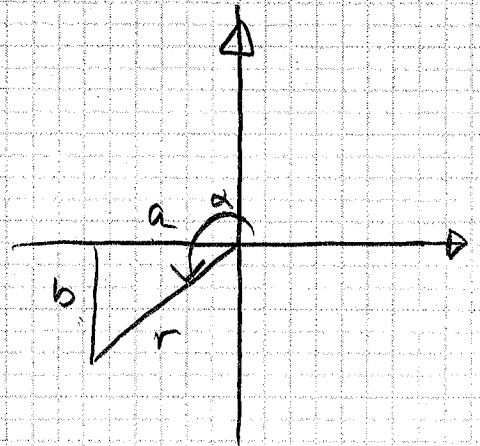
$$2 * \frac{16}{25} - 1 = \frac{32}{25} - 1 = \frac{32-25}{25} \rightarrow$$

$$\cos \alpha = -\frac{4}{5} \quad \pi < \alpha < \frac{3\pi}{2}$$

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

$$\tan(2\alpha) = \frac{2 \times \frac{3}{4}}{1 - \left(\frac{3}{4}\right)^2} = \frac{\frac{3}{2}}{1 - \frac{9}{16}}$$

$$= \frac{\frac{3}{2}}{\frac{16-9}{16}} = \frac{\frac{3}{2}}{\frac{7}{16}} = \frac{3}{2} \cdot \frac{16}{7} = \frac{24}{7}$$



$$\tan \alpha = \frac{b}{a} = \frac{-3}{-4} = \frac{3}{4}$$