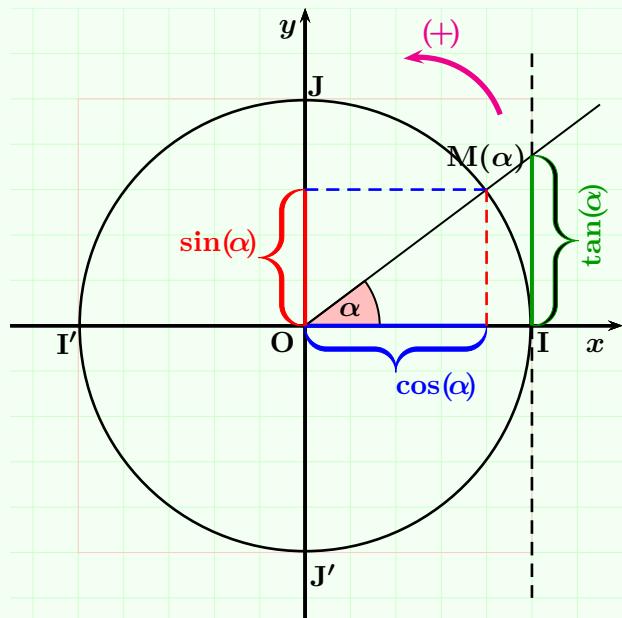


$$(\forall x \in \mathbb{R}) : \sin^2(x) + \cos^2(x) = 1$$

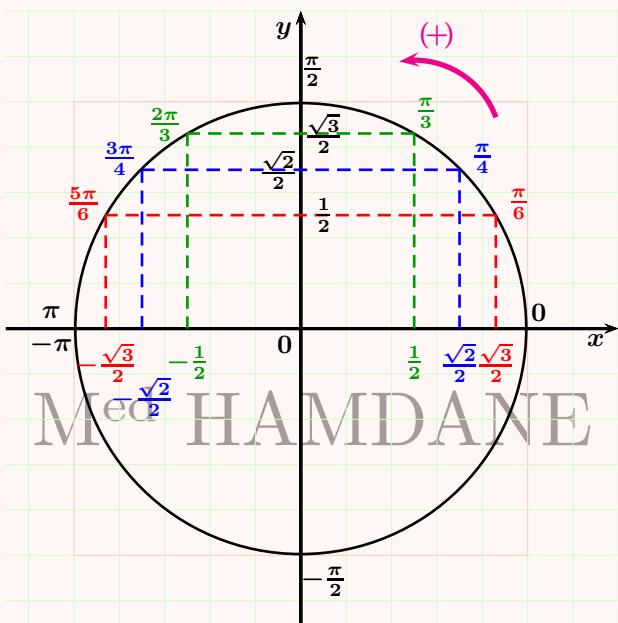
$$\forall x \neq \frac{\pi}{2} + k\pi / k \in \mathbb{Z} : \begin{cases} \cos^2(x) = \frac{1}{1 + \tan^2(x)} \\ \sin^2(x) = \frac{\tan^2(x)}{1 + \tan^2(x)} \end{cases}$$

$$\forall x \in \mathbb{R} \setminus \left\{ \frac{\pi}{2} + k\pi / k \in \mathbb{Z} \right\} : \tan(x) = \frac{\sin(x)}{\cos(x)}$$

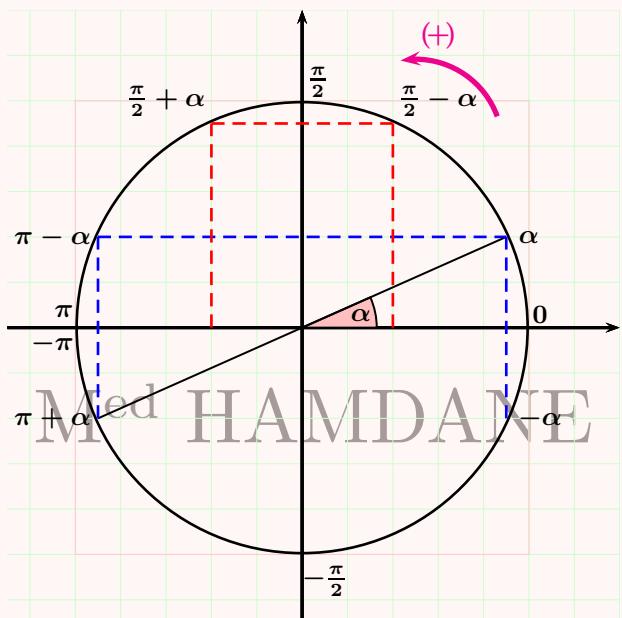
$$t = \tan\left(\frac{a}{2}\right) \quad \text{نضع} \\ \cos(a) = \frac{1 - t^2}{1 + t^2} \quad \text{و} \quad \sin(a) = \frac{2t}{1 + t^2} \quad \text{لدينا}$$



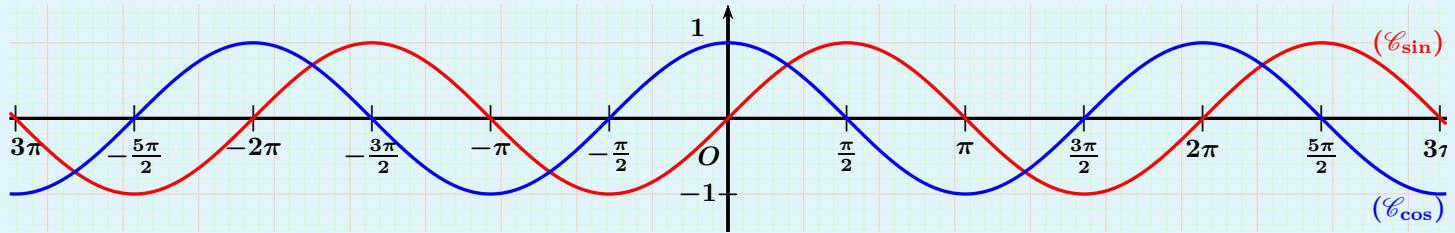
نسب مثلثية اعتيادية



العلاقة بين النسب المثلثية



التمثيل المباني لدالتا الجيب $\cos(x) \rightarrow \sin(x)$ و جيب التمام $\sin(x) \rightarrow x$ على المجال $[-3\pi; 3\pi]$



$$x \mapsto \sin(x) \quad \text{دالة الجيب}$$

$$\begin{aligned} \forall x \in \mathbb{R} : -1 \leq \sin(x) \leq 1 \\ \forall x \in \mathbb{R} : \sin(-x) = -\sin(x) \\ \forall k \in \mathbb{Z} : \sin(x + 2k\pi) = \sin(x) \\ \forall k \in \mathbb{Z} : \sin(x + k\pi) = (-1)^k \sin(x) \\ \forall n \in \mathbb{N} : \sin(n\frac{\pi}{2}) = (-1)^n \end{aligned}$$

$$\sin(x) = \sin(\alpha) \iff \begin{cases} x = \alpha + 2k\pi \\ x = \pi - \alpha + 2k\pi \end{cases}; k \in \mathbb{Z}$$

عادلات خاصة

$$\begin{aligned} \sin(x) = 1 &\iff x = \frac{\pi}{2} + 2k\pi, \quad k \in \mathbb{Z} \\ \sin(x) = 0 &\iff x = k\pi, \quad k \in \mathbb{Z} \\ \sin(x) = -1 &\iff x = -\frac{\pi}{2} + 2k\pi, \quad k \in \mathbb{Z} \end{aligned}$$

Med HAMDANE صيغ تحويل مجموع وع

$$\begin{aligned} \sin(a+b) &= \sin(a)\cos(b) + \cos(a)\sin(b) \\ \sin(a-b) &= \sin(a)\cos(b) - \cos(a)\sin(b) \end{aligned}$$

$$\begin{aligned} \sin(2a) &= 2\sin(a)\cos(a) \\ \sin(a) &= 2\sin\left(\frac{a}{2}\right)\cos\left(\frac{a}{2}\right) \\ \sin^2(a) &= \frac{1-\cos(2a)}{2} \end{aligned}$$

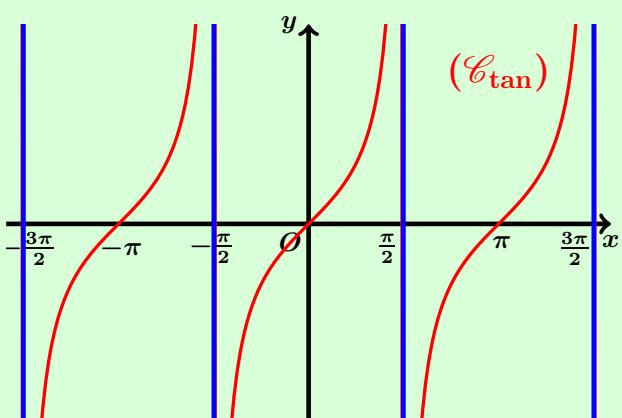
تحويل مجموع إلى جداء:

$$\begin{aligned} \sin(p) + \sin(q) &= 2\sin\left(\frac{p+q}{2}\right)\cos\left(\frac{p-q}{2}\right) \\ \sin(p) - \sin(q) &= 2\cos\left(\frac{p+q}{2}\right)\sin\left(\frac{p-q}{2}\right) \end{aligned}$$

تحويل جداء إلى مجموع:

$$\sin(a)\sin(b) = \frac{1}{2}[\cos(a+b) - \cos(a-b)]$$

التمثيل المباني لدالة الظل على $\left[-\frac{3\pi}{2}, \frac{3\pi}{2}\right] \setminus \left\{-\frac{\pi}{2}, \frac{\pi}{2}\right\}$



$(a, b) \neq (0, 0) \quad a \cos(x) + b \sin(x) \quad \text{تحويل الصيغة}$

$$\begin{aligned} \cos(\alpha) &= \frac{a}{\sqrt{a^2+b^2}} \\ \sin(\alpha) &= \frac{b}{\sqrt{a^2+b^2}} \end{aligned}$$

حيث:

$$\begin{aligned} a \cos(x) + b \sin(x) &= \sqrt{a^2+b^2} \left(\frac{a}{\sqrt{a^2+b^2}} \cos(x) + \frac{b}{\sqrt{a^2+b^2}} \sin(x) \right) \\ &= \sqrt{a^2+b^2} \cos(x - \alpha) \end{aligned}$$

$$x \mapsto \cos(x) \quad \text{دالة جيب التمام}$$

$$\begin{aligned} \forall x \in \mathbb{R} : -1 \leq \cos(x) \leq 1 \\ \forall x \in \mathbb{R} : \cos(-x) = \cos(x) \\ \forall k \in \mathbb{Z} : \cos(x + 2k\pi) = \cos(x) \\ \forall k \in \mathbb{Z} : \cos(x + k\pi) = (-1)^k \cos(x) \\ \forall n \in \mathbb{N} : \cos(n\pi) = (-1)^n \end{aligned}$$

$$\cos(x) = \cos(\alpha) \iff \begin{cases} x = \alpha + 2k\pi \\ x = -\alpha + 2k\pi \end{cases}; k \in \mathbb{Z}$$

عادلات خاصة

$$\begin{aligned} \cos(x) = 1 &\iff x = 2k\pi, \quad k \in \mathbb{Z} \\ \cos(x) = 0 &\iff x = \frac{\pi}{2} + k\pi, \quad k \in \mathbb{Z} \\ \cos(x) = -1 &\iff x = \pi + 2k\pi, \quad k \in \mathbb{Z} \end{aligned}$$

Med HAMDANE صيغ تحويل مجموع وع

$$\begin{aligned} \cos(a+b) &= \cos(a)\cos(b) - \sin(a)\sin(b) \\ \cos(a-b) &= \cos(a)\cos(b) + \sin(a)\sin(b) \end{aligned}$$

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

تحويل مجموع إلى جداء:

$$\begin{aligned} \cos(p) + \cos(q) &= 2\cos\left(\frac{p+q}{2}\right)\cos\left(\frac{p-q}{2}\right) \\ \cos(p) - \cos(q) &= -2\sin\left(\frac{p+q}{2}\right)\sin\left(\frac{p-q}{2}\right) \end{aligned}$$

تحويل جداء إلى مجموع:

$$\cos(a)\cos(b) = \frac{1}{2}[\cos(a+b) + \cos(a-b)]$$

دالة الظل

$$\begin{aligned} \forall x \in \mathbb{R} \setminus \left\{ \frac{\pi}{2} + k\pi \mid k \in \mathbb{Z} \right\} : \tan(-x) &= -\tan(x) \\ \forall k \in \mathbb{Z}, \tan(x + k\pi) &= \tan(x) \\ \tan(x) = \tan(\alpha) &\iff x = \alpha + k\pi, \quad k \in \mathbb{Z} \end{aligned}$$

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

$$\tan(2a) = \frac{2\tan(a)}{1-\tan^2(a)} \quad \tan^2(a) = \frac{1-\cos(2a)}{1+\cos(2a)}$$

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