Equations trigonométriques simples

1) $2\sin(2x)+1=0$

2) $\sqrt{2}\cos(3x)+1=0$

3) $\mathrm{tg}(2x)+\sqrt{3}=0$

4) $2\cos\left(\frac{\pi}{4}+x\right)+\sqrt{3}=0$

5) $-\sqrt{3}\,\mathrm{tg}\left(\frac{\pi}{3}-2x\right)-1=0$

6) $\sin\left(\frac{\pi}{4}+x\right)+1=0$

7) $2\cos\left(\frac{\pi}{3}-3x\right)+1=0$

8) $\mathrm{tg}(2x)=\sqrt{3}$

9) $\sin\left(\frac{\pi}{6}-3x\right)=\frac{1}{2}$

10) $\cos\left(\frac{\pi}{6}+x\right)=0$

Solutions

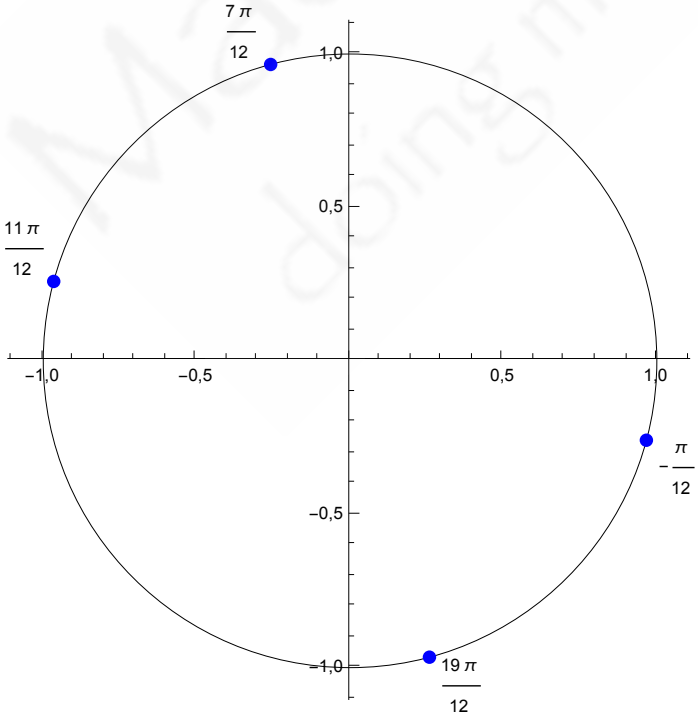
1)

$$\sin(2x)=-\frac{1}{2}$$

$$\sin(2x)=\sin\left(-\frac{\pi}{6}\right)$$

$$\begin{cases} 2x=-\frac{\pi}{6}+2k\pi & (1) \\ 2x=\frac{7\pi}{6}+2k\pi & (2) \end{cases}$$

$$\begin{cases} x=-\frac{\pi}{12}+k\pi & (1) \\ x=\frac{7\pi}{12}+k\pi & (2) \end{cases}$$



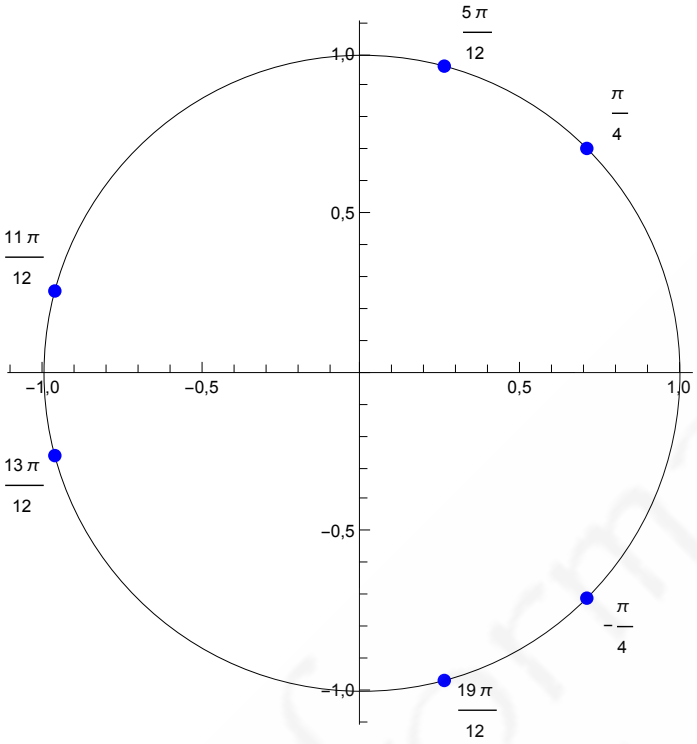
2)

$$\cos(3\,x) = -\frac{1}{\sqrt{2}}$$

$$\cos(3\,x) = \cos\left(\frac{3\,\pi}{4}\right)$$

$$\begin{cases} 3\,x = \frac{3\,\pi}{4} + 2\,k\,\pi & (1) \\ 3\,x = -\frac{3\,\pi}{4} + 2\,k\,\pi & (2) \end{cases}$$

$$\begin{cases} x = \frac{\pi}{4} + \frac{2\,k\,\pi}{3} & (1) \\ x = -\frac{\pi}{4} + \frac{2\,k\,\pi}{3} & (2) \end{cases}$$



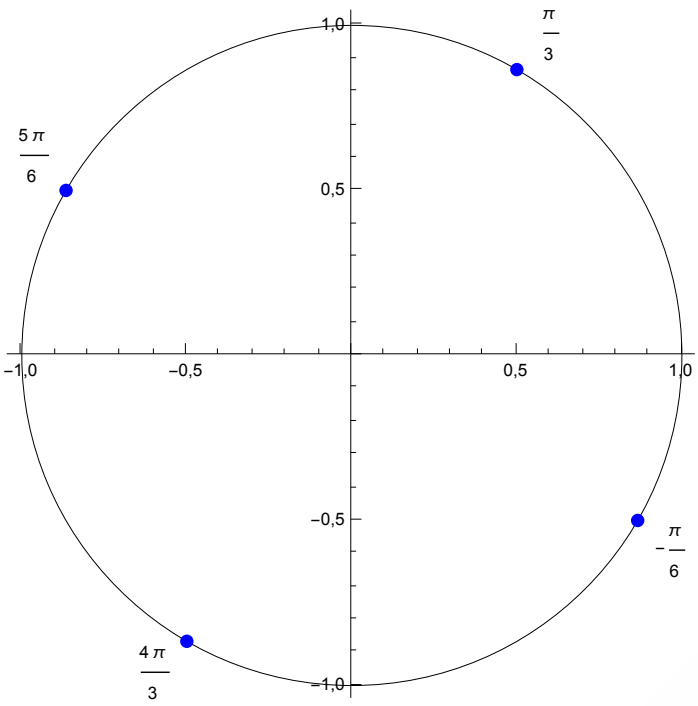
3)

$$\text{tg}(2\,x) = -\sqrt{3}$$

$$\text{tg}(2\,x) = \text{tg}(-\frac{\pi}{3})$$

$$2\,x = -\frac{\pi}{3} + k\,\pi$$

$$x = -\frac{\pi}{6} + \frac{k\,\pi}{2}$$



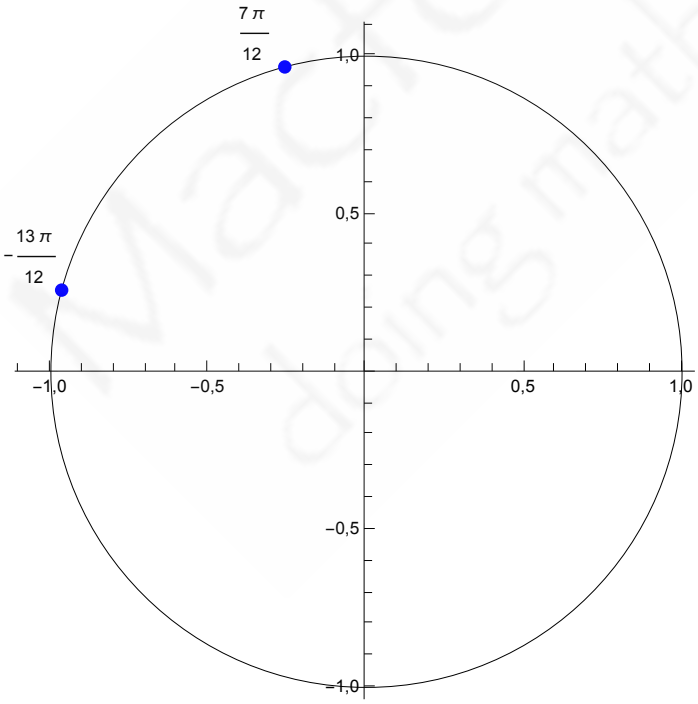
4)

$$\cos\left(x+\frac{\pi}{4}\right)=-\frac{\sqrt{3}}{2}$$

$$\cos\left(x+\frac{\pi}{4}\right)=\cos\left(\frac{5\pi}{6}\right)$$

$$\begin{cases}\frac{\pi}{4}+x=\frac{5\pi}{6}+2k\pi & (1)\\ \frac{\pi}{4}+x=-\frac{5\pi}{6}+2k\pi & (2)\end{cases}$$

$$\begin{cases}x=\frac{7\pi}{12}+2k\pi & (1)\\ x=-\frac{13\pi}{12}+2k\pi & (2)\end{cases}$$



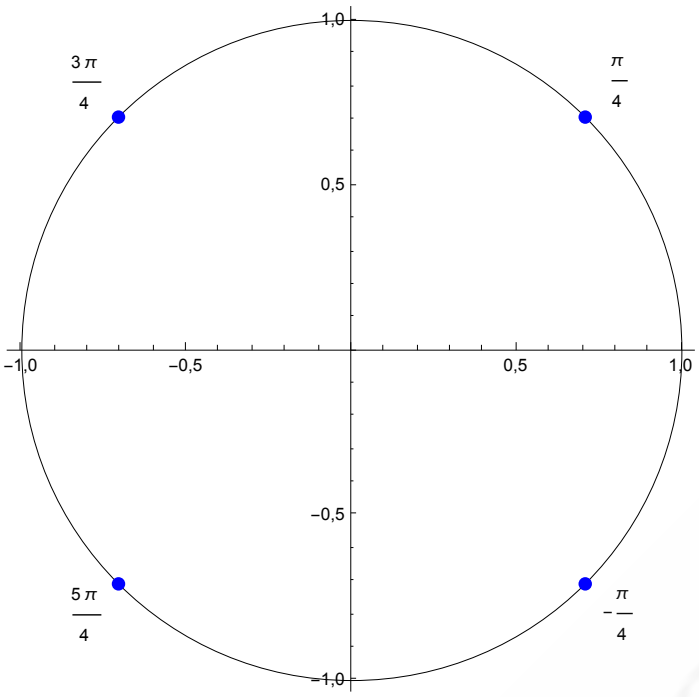
5)

$$\mathrm{tg}\left(\frac{\pi}{3}-2x\right)=-\frac{1}{\sqrt{3}}$$

$$\mathrm{tg}\left(\frac{\pi}{3}-2x\right)=\mathrm{tg}(-\frac{\pi}{6})$$

$$\frac{\pi}{3} - 2x = -\frac{\pi}{6} + k\pi$$

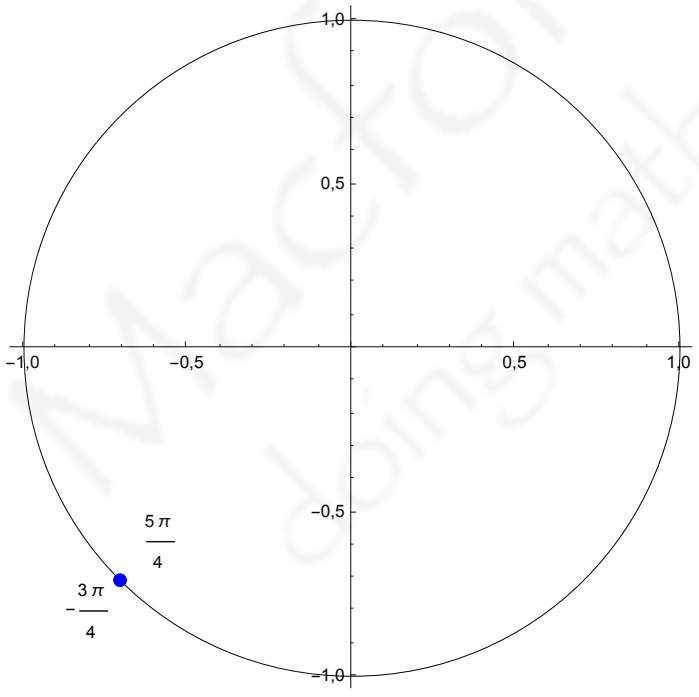
$$x = \frac{\pi}{4} - \frac{k\pi}{2}$$



6)

$$\sin\left(\frac{\pi}{4} + x\right) = -1$$

$$\sin\left(\frac{\pi}{4} + x\right) = \sin\left(-\frac{\pi}{2}\right) \iff \frac{\pi}{4} + x = -\frac{\pi}{2} + 2k\pi \iff x = -\frac{3\pi}{4} + 2k\pi$$



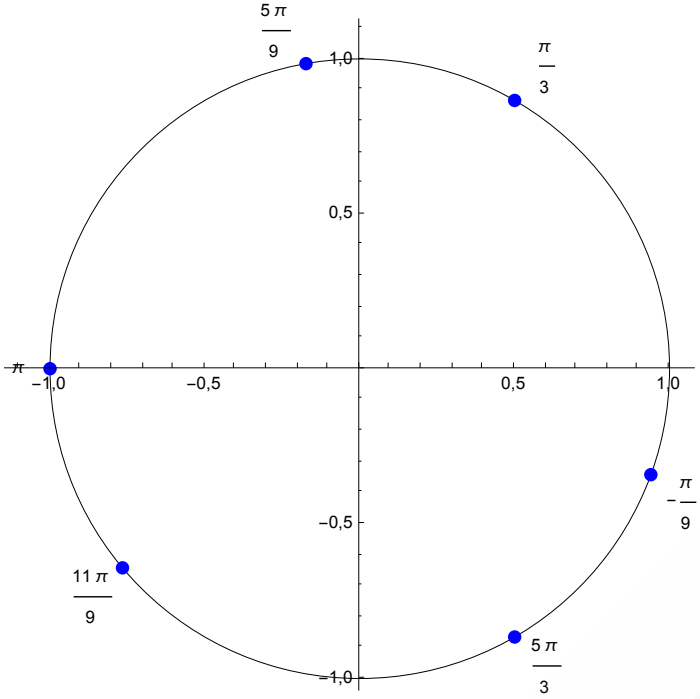
7)

$$\cos\left(\frac{\pi}{3} - 3x\right) = -\frac{1}{2}$$

$$\cos\left(\frac{\pi}{3} - 3x\right) = \cos\left(\frac{2\pi}{3}\right)$$

$$\begin{cases} \frac{\pi}{3} - 3x = \frac{2\pi}{3} + 2k\pi & (1) \\ \frac{\pi}{3} - 3x = -\frac{2\pi}{3} + 2k\pi & (2) \end{cases}$$

$$\begin{cases} x = -\frac{\pi}{9} - \frac{2k\pi}{3} & (1) \\ x = \frac{\pi}{3} - \frac{2k\pi}{3} & (2) \end{cases}$$



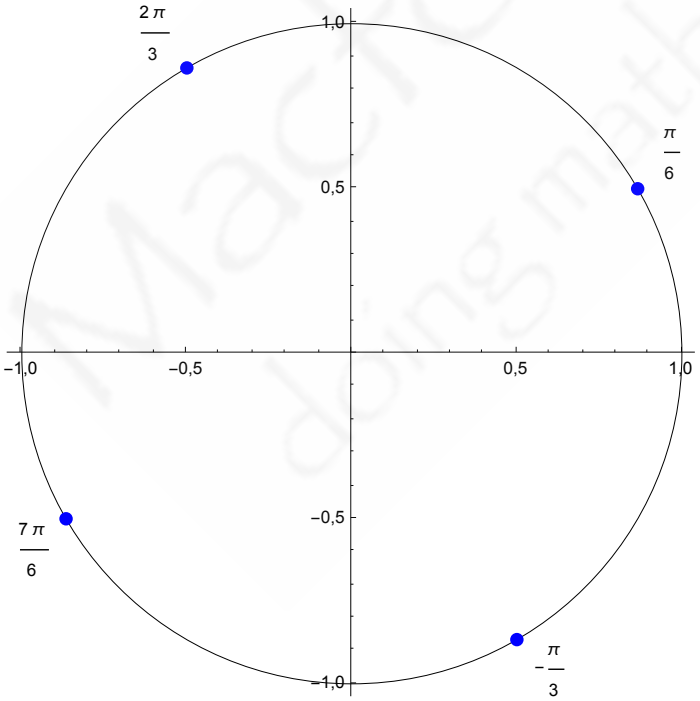
8)

$\text{tg}(2x) = \sqrt{3}$

$\text{tg}(2x) = \text{tg}(\frac{\pi}{3})$

$2x = \frac{\pi}{3} + k\pi$

$x = \frac{\pi}{6} + \frac{k\pi}{2}$



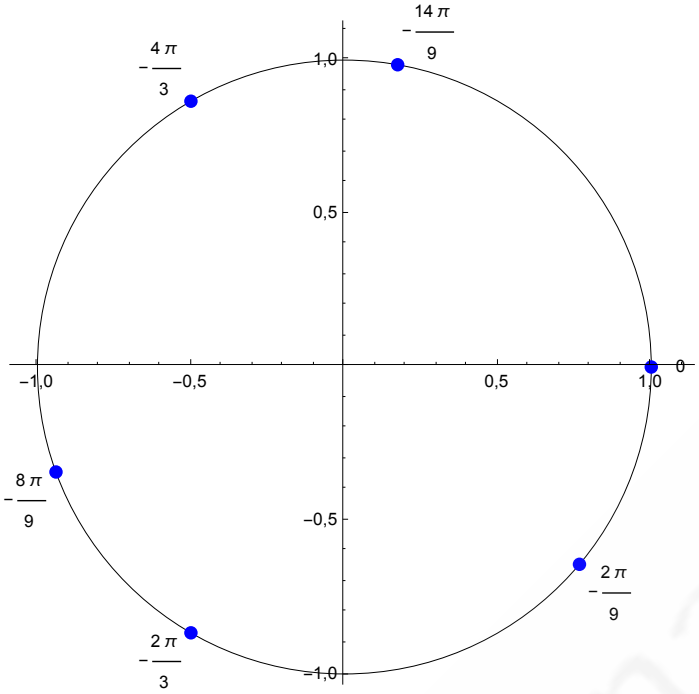
9)

$\sin\left(\frac{\pi}{6} - 3x\right) = \frac{1}{2}$

$\sin\left(\frac{\pi}{6} - 3x\right) = \sin\left(\frac{\pi}{6}\right)$

$$\begin{cases} \frac{\pi}{6} - 3x = \frac{\pi}{6} + 2k\pi & (1) \\ \frac{\pi}{6} - 3x = \frac{5\pi}{6} + 2k\pi & (2) \end{cases}$$

$$\begin{cases} x = -\frac{2k\pi}{3} & (1) \\ x = -\frac{2\pi}{9} - \frac{2k\pi}{3} & (2) \end{cases}$$



10)

$$\cos\left(\frac{\pi}{6} + x\right) = 0$$

$$\cos\left(\frac{\pi}{6} + x\right) = \cos\left(\frac{\pi}{2}\right) \iff \frac{\pi}{6} + x = \frac{\pi}{2} + k\pi \iff x = \frac{\pi}{3} + k\pi$$