TRIGONOMETRIC EQUATIONS

GENERAL SOLUTIONS

Question 1 (**)

Find the general solution of the trigonometric equation

$$\cos(4x-40)^\circ = -0.5 .$$

$$\boxed{x = \begin{cases} (4 \pm 9n)10^\circ \\ (7 \pm 9n)10^\circ \end{cases} \quad n = 0,1,2,3,...}$$

Question 2 (**)

Find the general solution of the trigonometric equation

$$\sin\left(x + \frac{\pi}{3}\right) = \sqrt{3} .$$

$$\boxed{x = \begin{cases} (11 \pm 12n)\dfrac{\pi}{6} \\ (1 \pm 4n)\dfrac{\pi}{2} \end{cases} \quad n = 0,1,2,3,...}$$

Question 3 (**)

Find the general solution of the trigonometric equation

$$\sqrt{2}\cos\left(2x+\frac{\pi}{6}\right)=1.$$

$$\boxed{x=\begin{cases}(1\pm 24n)\dfrac{\pi}{24} \\ (19\pm 24n)\dfrac{19\pi}{24}\end{cases}\quad n=0,1,2,3,...}$$

Question 4 (**)

Find the general solution of the trigonometric equation

$$\sin\left(4x+10\right)^\circ=\sin 50^\circ.$$

$$\boxed{x=\begin{cases}(1\pm 9n)10^\circ \\ (1\pm 3n)30^\circ\end{cases}\quad n=0,1,2,3,...}$$

Question 5 (**)

Find the general solution of the trigonometric equation

$$\cos(3x)^\circ = \cos 30^\circ .$$

$$\boxed{x = (\pm 1 \pm 12n)10^\circ, \quad n = 0,1,2,3,...}$$

Question 6 (**)

Find the general solution of the trigonometric equation

$$\tan\left(x + \frac{\pi}{3}\right) = 1 .$$

$$\boxed{x = (11 \pm 12n)\frac{\pi}{12}, \quad n = 0,1,2,3,...}$$

Question 7 (**)

Find the general solution of the trigonometric equation

$$\tan\left(2x-\frac{\pi}{4}\right)=\sqrt{3}\,.$$

$$\boxed{x=(7\pm 12n)\frac{\pi}{24},\quad n=0,1,2,3,...}$$

Question 8 (**)

Find the general solution of the trigonometric equation

$$2\sin\left(2x-\frac{\pi}{2}\right)=\sqrt{3}\,.$$

$$\boxed{x=\begin{cases}(5\pm 6n)\dfrac{\pi}{12}\\ (7\pm 6n)\dfrac{\pi}{12}\end{cases}\quad n=0,1,2,3,...}$$

Question 9 (**)

Find the general solution of the trigonometric equation

$$\sqrt{2}\sin\left(\frac{x}{2}+\frac{\pi}{4}\right)=1.$$

$$\boxed{x=\begin{cases}(0\pm 4n)\pi \\ (1\pm 4n)\pi\end{cases}\quad n=0,1,2,3,...}$$

Question 10 (**)

Find the general solution of the trigonometric equation

$$\tan\left(\frac{\pi}{2}-3x\right)=\sqrt{3}\,.$$

$$\boxed{x=(1\pm 6n)\frac{\pi}{18},\quad n=0,1,2,3,...}$$

Question 11 (**)

Find the general solution of the trigonometric equation

$$\tan^2(30-x)^\circ = \sqrt{3}\,.$$

$$\boxed{x = \begin{cases} (5\pm 6n)30^\circ \\ (1\pm 2n)90^\circ \end{cases} \quad n = 0,1,2,3,...}$$

Question 12 (**)

Find **in degrees** the general solution of the trigonometric equation

$$2\cos\theta\tan\theta = \sqrt{3}\,.$$

$$\boxed{\theta = \begin{cases} (1\pm 6n)60^\circ \\ (1\pm 3n)120^\circ \end{cases} \quad n = 0,1,2,3,...}$$

Question 13 (**)

Find **in radians** the general solution of the trigonometric equation

$$\cos 3\theta = \cos 2\theta .$$

$$\boxed{\theta = \pm \frac{2n\pi}{5}, \quad n = 0,1,2,3,...}$$

Question 14 (**)

Find **in radians** the general solution of the trigonometric equation

$$\sin 2x = \cos x .$$

$$\boxed{x = \begin{cases} (1 \pm 4n)\dfrac{\pi}{2} \\ (1 \pm 4n)\dfrac{\pi}{6} \end{cases} \quad n = 0,1,2,3,...}$$

Question 15 (**)

Find **in degrees** the general solution of the trigonometric equation

$$\sin 2\theta + \cos\theta = 0 .$$

$$\boxed{\theta = \begin{cases} (3 \pm 4n)30^\circ \\ (3 \pm 4n)90^\circ \end{cases} \quad n = 0,1,2,3,...}$$

Question 16 (**)

Find **in degrees** the general solution of the trigonometric equation

$$\cos 2\theta = \cos(\theta + 60) .$$

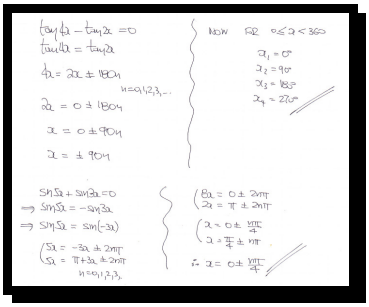
$$\boxed{\theta = \begin{cases} (1 \pm 6n)60^\circ \\ (5 \pm 6n)20^\circ \end{cases} \quad n = 0,1,2,3,...}$$

Question 17 (**)

Solve in degrees the trigonometric equation

$$\tan 4x - \tan 2x = 0 , \ 0 \le x < 360 .$$

$$\boxed{x = 0^\circ, 90^\circ, 180^\circ, 270^\circ}$$



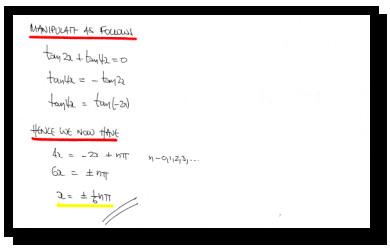
Question 18 (**)

Find the general solution of the following trigonometric equation

$$\tan 2x + \tan 4x = 0,$$

where x is measured in radians.

$\boxed{}$, $\boxed{x = \pm\frac{1}{6}n\pi,\ n \in \mathbb{N}}$



Question 19 **(***)**

Show that if x is measured in radians, the general solution of

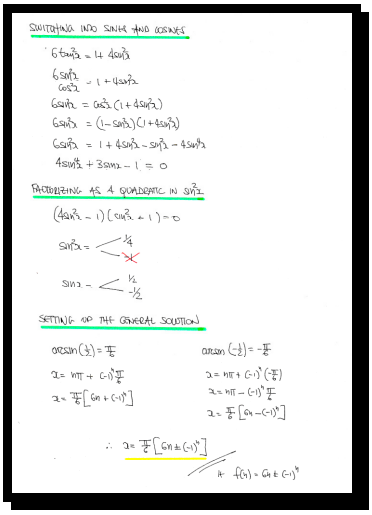
$$6\tan^2 x = 1 + 4\sin^2 x,$$

is given by

$$x = \frac{1}{6}\pi f(n),$$

where $f(n)$ is an integer function to be found.

$\boxed{}$, $\boxed{f(n) = 6n \pm (-1)^n}$



Question 20 **(***)**

Show that if x is measured in radians, the general solution of

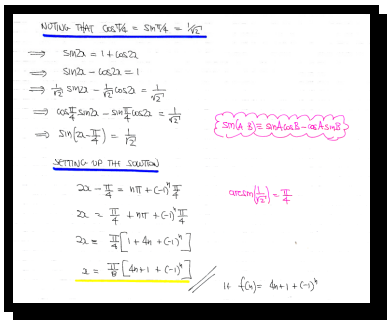
$$\sin 2x = 1 + \cos 2x ,$$

is given by

$$x = \frac{1}{8}\pi f(n),$$

where $f(n)$ is an integer function to be found.

$\square$, $\boxed{f(n) = 4n + 1 + (-1)^n}$



Question 21 (***)

Find **in radians** the general solution of the trigonometric equation

$$\cos 3x + \cos x = 0 .$$

$$\boxed{x = \begin{cases} (1 \pm 2n)\dfrac{\pi}{4} \\ (1 \pm 2n)\dfrac{\pi}{2} \end{cases} \quad n = 0,1,2,3,...}$$

Question 22 (***)

Find **in degrees** the general solution of the trigonometric equation

$$\sqrt{3}\sin\theta - \cos\theta = \sqrt{2} .$$

$$\boxed{\theta = \begin{cases} (5 \pm 24n)15^\circ \\ (11 \pm 24n)15^\circ \end{cases} \quad n = 0,1,2,3,...}$$

Question 23 (***)

Find **in radians** the general solution of the trigonometric equation

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

$$\boxed{x=(1\pm 3n)\frac{\pi}{3},\quad n=0,1,2,3,...}$$

Question 24 (***)

Find **in degrees** the general solution of the trigonometric equation

$$\sin 2\theta-\tan\theta=0\,.$$

$$\boxed{\theta=\begin{cases}(1\pm 4n)45^\circ\\(3\pm 4n)45^\circ\end{cases}\quad n=0,1,2,3,...}$$

Question 25 (***)

Find **in degrees** the general solution of the trigonometric equation

$$\sin\theta+\cos\theta=\frac{1}{\sqrt{2}}.$$

$$\boxed{\theta=\begin{cases}(7\pm 24n)15^\circ\\(13\pm 24n)15^\circ\end{cases}\quad n=0,1,2,3,...}$$

Question 26 (***)

Find **in radians** the general solution of the trigonometric equation

$$\cos 2x+1=\sin 2x.$$

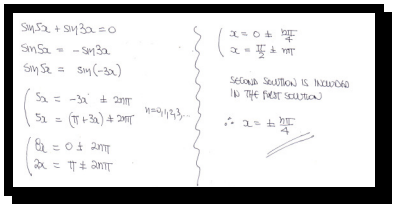
$$\boxed{x=\begin{cases}(1\pm 4n)\dfrac{\pi}{4}\\(1\pm 2n)\dfrac{\pi}{2}\end{cases}\quad n=0,1,2,3,...}$$

Question 27

Find, in radians, the general solution of the trigonometric equation

$$\sin 5x+\sin 3x=0.$$

$$\boxed{x=\pm\frac{n\pi}{4},\quad n=0,1,2,3,...}$$

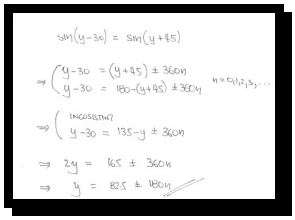


Question 28 (***) (non calculator)

Find the general solution of the trigonometric equation

$$\sin\left(y-30\right)=\sin\left(y-45\right).$$

$$\boxed{y=82.5°\pm 180°n,\quad n=0,1,2,3,...}$$

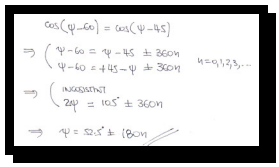


Question 29 (***) (non calculator)

Find the general solution of the trigonometric equation

$$\cos\left(\psi-60\right)=\cos\left(\psi-45\right),\ \ 0\le\psi<360°.$$

$$\boxed{\psi=52.5°\pm 180°n,\quad n=0,1,2,3,...}$$

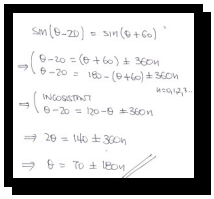


Question 30 (***) (non calculator)

Find the general solution of the trigonometric equation

$$\sin(\theta-20)=\sin(\theta+60),\quad 0\le\theta<360^\circ.$$

$$\boxed{\theta=70^\circ\pm180^\circ n,\quad n=0,1,2,3,...}$$

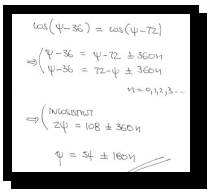


Question 31 (***) (non calculator)

Find the general solution of the trigonometric equation

$$\cos(\psi-36)=\cos(\psi-72),\quad 0\le\psi<360^\circ.$$

$$\boxed{\psi=54^\circ\pm180^\circ n,\quad n=0,1,2,3,...}$$

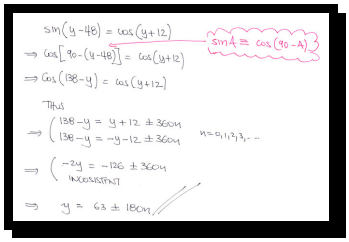


Question 32 (*+) (non calculator)**

Find the general solution of the trigonometric equation

$$\sin\left(y-48\right)=\cos\left(y+12\right),\quad 0\le y<360^\circ .$$

$$\boxed{y=63^\circ\pm 180^\circ n,\quad n=0,1,2,3,\ldots}$$



Question 33 (*+) (non calculator)**

Find the general solution of the trigonometric equation

$$\sin\left(\varphi+30\right)=\cos\left(\varphi-45\right),\quad 0\le \varphi<360^\circ .$$

$$\boxed{\varphi=52.5^\circ\pm 180^\circ n,\quad n=0,1,2,3,\ldots}$$

