EJERCICIOS RESUELTOS DE ECUACIONES TRIGONOMÉTRICAS

1.-

Resuelve las siguientes ecuaciones y da los resultados en grados y en radianes.

a) $\text{sen } x = 1$
b) $\text{tg } x = 0$
c) $2 \cos x + 1 = 0$
d) $\sqrt{3}\ \text{tg } x - 1 = 0$

2.-

(TIC) Resuelve las siguientes ecuaciones trigonométricas indicando todas sus soluciones en grados.

a) $\text{sen } x = \dfrac{1}{2}$
b) $\cos x = \dfrac{\sqrt{3}}{2}$
c) $\text{tg } x = 1$
d) $\text{sen } x = -\dfrac{\sqrt{2}}{2}$
e) $\cos x = \dfrac{1}{2}$
f) $\text{tg } x = -\dfrac{\sqrt{3}}{3}$
g) $\text{sen } x = 0$
h) $1 + \cos x = 0$

3.-

(TIC) Resuelve las siguientes ecuaciones trigonométricas indicando todas sus soluciones en radianes.

a) $\text{sen } 4x = -\dfrac{\sqrt{3}}{2}$
b) $\cos 2x = \dfrac{\sqrt{2}}{2}$
c) $\text{tg } 3x = -1$
d) $\text{sen } \dfrac{x}{2} = 0$
e) $\cos \dfrac{x}{3} = -\dfrac{1}{2}$
f) $\text{tg } \dfrac{3x}{4} = -\dfrac{\sqrt{3}}{3}$

4.-

(TIC) Halla todas las soluciones de las siguientes ecuaciones trigonométricas.

a) $\text{sen } x = \cos x$
b) $\text{sen } 2x - \text{sen } x = 0$
c) $\text{sen } x - \sqrt{3} \cos x = 0$
d) $\text{sen } x + \cos x = \sqrt{2}$

5.-

(TIC) Resuelve las siguientes ecuaciones trigonométricas en el intervalo [0°, 360°].

a) $\text{tg } x + 4 \text{cotg } x = 5$
b) $8 \cos 2x = 8 \cos x - 9$
c) $\text{tg } 2x = \text{cotg } x$
d) $2 \text{sen}^2 x + \cos 2x = 4 \cos^2 x$

6.-

(TIC) Halla las soluciones de las siguientes ecuaciones trigonométricas comprendidas en el intervalo $[0, 2\pi]$.

a) $\text{sen}^2 x + \text{tg}^2 x = 0$
b) $2 \text{sen } x + \sqrt{3} \text{tg } x = 0$
c) $\cos 2x - \text{sen } x - \text{sen } 2x - \cos x$

7.-

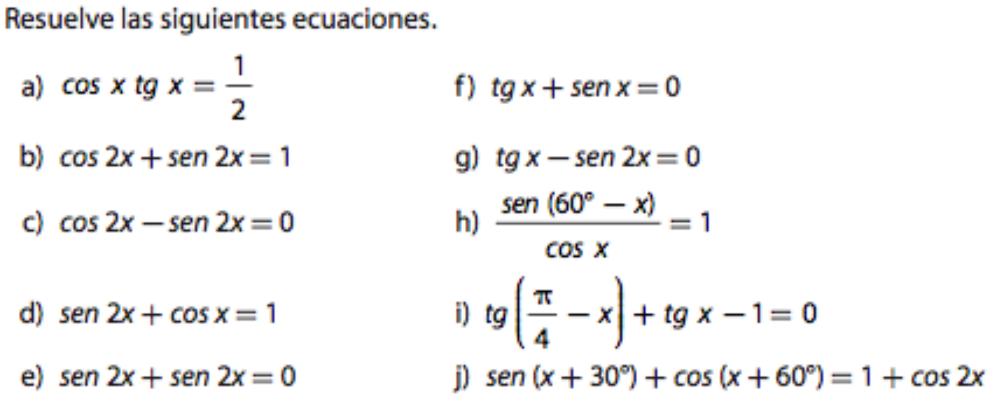
(TIC) Resuelve las siguientes ecuaciones trigonométricas en el intervalo $[-\pi, \pi]$.

a) $\text{sen } 3x + \text{sen } 6x = 0$
b) $\cos 5x + \cos 3x = \cos x$
c) $\sqrt{3} \cos x + \text{sen } x = 2$

8.-

Resuelve la ecuación trigonométrica $\text{sen}^4 x - \cos^4 x = \dfrac{1}{2}$

9.-



Resuelve las siguientes ecuaciones.

a) $\cos x \; tg\, x = \dfrac{1}{2}$

b) $\cos 2x + sen\, 2x = 1$

c) $\cos 2x - sen\, 2x = 0$

d) $sen\, 2x + \cos x = 1$

e) $sen\, 2x + sen\, 2x = 0$

f) $tg\, x + sen\, x = 0$

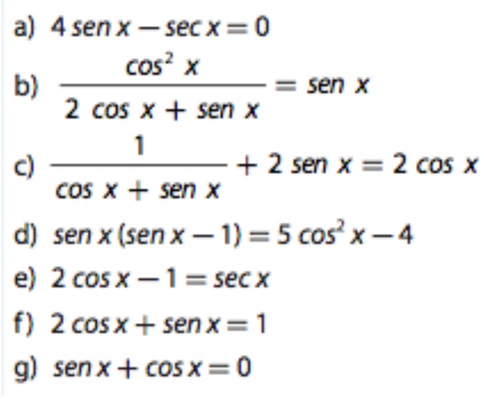
g) $tg\, x - sen\, 2x = 0$

h) $\dfrac{sen\,(60° - x)}{\cos x} = 1$

i) $tg\left(\dfrac{\pi}{4} - x\right) + tg\, x - 1 = 0$

j) $sen\,(x + 30°) + \cos\,(x + 60°) = 1 + \cos 2x$

10.-



a) $4\, sen\, x - \sec x = 0$

b) $\dfrac{\cos^2 x}{2\cos x + sen\, x} = sen\, x$

c) $\dfrac{1}{\cos x + sen\, x} + 2\, sen\, x = 2\cos x$

d) $sen\, x\,(sen\, x - 1) = 5\cos^2 x - 4$

e) $2\cos x - 1 = \sec x$

f) $2\cos x + sen\, x = 1$

g) $sen\, x + \cos x = 0$

SOLUCIONES

1.-

a) $\text{sen}\ x = 1$ El seno de un ángulo vale 1 únicamente en 90°, 450°, 810°, etc.

Por tanto: $x = 90° + 360°\ k$ con $k \in Z$ o $x = \frac{\pi}{2} + 2\pi k$ con $k \in Z$

b) $\text{tg}\ x = 0$ La tangente vale 0 en los ángulos 0°, 180°, 360°, 540°, etc.

Por tanto: $x = 180°\ k$ con $k \in Z$ o $x = \pi k$ con $k \in Z$

c) $\cos x = -\frac{1}{2}$ El coseno es negativo para los ángulos de los cuadrantes 2.° y 3.°

Por tanto: $x = 120° + 360°\ k$, $x = 240° + 360°\ k$ con $k \in Z$ o $x = \frac{2\pi}{3} + 2\pi k$, $x = \frac{4\pi}{3} + 2\pi k$ con $k \in Z$

d) $\text{tg}\ x = \frac{\sqrt{3}}{3}$ La tangente es positiva para los ángulos de los cuadrantes 1.° y 3.°

Por tanto: $x = 30° + 360°\ k$, $x = 210° + 360°\ k$ con $k \in Z$ o $x = \frac{\pi}{6} + 2\pi k$ $x = \frac{7\pi}{6} + 2\pi k$ con $k \in Z$

2.-

a) $\text{sen}\ x = \frac{1}{2} \Rightarrow \begin{cases} x = 30° + 360°\,k \\ x = 150° + 360°\,k \end{cases}$

b) $\cos x = \frac{\sqrt{3}}{2} \Rightarrow \begin{cases} x = 30° + 360°\,k \\ x = 330° + 360°\,k \end{cases}$

c) $\text{tg}\ x = 1 \Rightarrow \begin{cases} x = 45° + 360°\ k \\ x = 225° + 360°\,k \end{cases}$

d) $\text{sen}\ x = -\frac{\sqrt{2}}{2} \Rightarrow \begin{cases} x = 225° + 360°\,k \\ x = 315° + 360°\,k \end{cases}$

e) $\cos x = -\frac{1}{2} \Rightarrow \begin{cases} x = 120° + 360°\,k \\ x = 240° + 360°\,k \end{cases}$

f) $\text{tg}\ x = -\frac{\sqrt{3}}{2} \Rightarrow \begin{cases} x = 150° + 360°\,k \\ x = 330° + 360°\,k \end{cases}$

f) $\text{sen}\ x = 0 \Rightarrow x = 180°\,k$

g) $1 - \cos x = 0 \Rightarrow x = 360°\,k$

3.-

a) $\text{sen}\ 4x = -\frac{\sqrt{3}}{2} \Rightarrow \begin{cases} 4x = \frac{4\pi}{3} + 2\pi k \\ 4x = \frac{5\pi}{3} + 2\pi k \end{cases} \Rightarrow \begin{cases} x = \frac{\pi}{3} + \frac{\pi k}{2} \\ x = \frac{5\pi}{12} + \frac{\pi k}{2} \end{cases}$

b) $\cos 2x = \frac{\sqrt{2}}{2} \Rightarrow \begin{cases} 2x = \frac{\pi}{4} + 2\pi k \\ 2x = \frac{7\pi}{4} + 2\pi k \end{cases} \Rightarrow \begin{cases} x = \frac{\pi}{8} + \pi k \\ x = \frac{7\pi}{8} + \pi k \end{cases}$

c) $\text{tg}\ 3x = -1 \Rightarrow \begin{cases} 3x = \frac{3\pi}{4} + 2\pi k \\ 3x = \frac{7\pi}{4} + 2\pi k \end{cases} \Rightarrow \begin{cases} x = \frac{\pi}{4} + \frac{2\pi k}{3} \\ x = \frac{7\pi}{12} + \frac{2\pi k}{3} \end{cases}$

d) $\text{sen}\ \frac{x}{2} = 0 \Rightarrow \frac{x}{2} = \pi k \Rightarrow x = 2\pi k$

e) $\cos \frac{x}{3} = -\frac{1}{2} \Rightarrow \begin{cases} \frac{x}{3} = \frac{2\pi}{3} + 2\pi k \\ \frac{x}{3} = \frac{4\pi}{3} + 2\pi k \end{cases} \Rightarrow \begin{cases} x = 2\pi + 6\pi k \\ x = 4\pi + 6\pi k \end{cases}$

f) $\text{tg}\ \frac{3x}{4} = -\frac{\sqrt{3}}{3} \Rightarrow \begin{cases} \frac{3x}{4} = \frac{5\pi}{6} + 2\pi k \\ \frac{3x}{4} = \frac{11\pi}{6} + 2\pi k \end{cases} \Rightarrow \begin{cases} x = \frac{10\pi}{9} + \frac{8\pi k}{3} \\ x = \frac{22\pi}{9} + \frac{8\pi k}{3} \end{cases}$

4.-

a) $\text{sen}\,x = \cos x \Rightarrow \text{tg}\,x = 1 \Rightarrow \begin{cases} x = 45° + 360°\,k \\ x = 225° + 360°\,k \end{cases}$

b) $\text{sen}\,2x - \text{sen}\,x = 0 \Rightarrow 2\,\text{sen}\,x \cos x - \text{sen}\,x = 0 \Rightarrow \text{sen}\,x(2\cos x - 1) = 0 \Rightarrow \begin{cases} \text{sen}\,x = 0 \Rightarrow x = 180°\,k \\ \cos x = \frac{1}{2} \Rightarrow \begin{cases} x = 60° + 360°\,k \\ x = 300° + 360°\,k \end{cases} \end{cases}$

c) $\text{sen}\,x - \sqrt{3}\cos x = 0 \Rightarrow \text{tg}\,x = \sqrt{3} \Rightarrow \begin{cases} x = 60° + 360°\,k \\ x = 240° + 360°\,k \end{cases}$

d) $\text{sen}\,x + \cos x = \sqrt{2} \Rightarrow \text{sen}\,x + \sqrt{1 - \text{sen}^2 x} = \sqrt{2} \Rightarrow 1 - \text{sen}^2 x = 2 + \text{sen}^2 x - 2\sqrt{2}\text{sen}\,x \Rightarrow$

$\Rightarrow 2\,\text{sen}^2 x - 2\sqrt{2}\,\text{sen}\,x + 1 = 0 \Rightarrow \text{sen}\,x = \frac{2\sqrt{2}}{4} = \frac{\sqrt{2}}{2} \Rightarrow x = 45° + 360°\,k$

5.-

a) $\operatorname{tg} x + 4 \cot g\, x = 5 \Rightarrow \operatorname{tg} x + \dfrac{4}{\operatorname{tg} x} = 5 \Rightarrow \operatorname{tg}^2 x + 4 = 5 \operatorname{tg} x \Rightarrow \operatorname{tg}^2 x - 5 \operatorname{tg} x + 4 = 0 \Rightarrow$

$$\operatorname{tg} x = \frac{5 \pm \sqrt{25 - 16}}{2} \Rightarrow \begin{cases} \operatorname{tg} x = 4 \Rightarrow x = 75^\circ\, 58'\ x = 255^\circ\, 58' \\ \operatorname{tg} x = 1 \Rightarrow x = 45^\circ\ x = 225^\circ \end{cases}$$

b) $8 \cos 2x = 8 \cos x - 9 \Rightarrow 8 \cos^2 x - 8 \operatorname{sen}^2 x - 8 \cos x + 9 = 0 \Rightarrow$

$\Rightarrow 8 \cos^2 x - 8 + 8 \cos^2 x - 8 \cos x + 9 = 0 \Rightarrow 16 \cos^2 x - 8 \cos x + 1 = 0 \Rightarrow$

$\Rightarrow \cos x = \dfrac{8 \pm \sqrt{64-64}}{32} = \dfrac{1}{4} \Rightarrow x = 75^\circ\, 31'\ ;\ x = 284^\circ\, 29'$

c) $\operatorname{tg} 2x = \cot g\, x \Rightarrow \dfrac{2 \operatorname{tg} x}{1 - \operatorname{tg}^2 x} = \dfrac{1}{\operatorname{tg} x} \Rightarrow \dfrac{2 \operatorname{tg}^2 x}{1 - \operatorname{tg}^2 x} = 1 \Rightarrow 2 \operatorname{tg}^2 x = 1 - \operatorname{tg}^2 x \Rightarrow \operatorname{tg}^2 x = \dfrac{1}{3} \Rightarrow \operatorname{tg} x = \pm \dfrac{\sqrt{3}}{3} \Rightarrow \begin{cases} x = 30^\circ, x = 210^\circ \\ x = 150^\circ, x = 330^\circ \end{cases}$

d) $2 \operatorname{sen}^2 x + \cos 2x = 4 \cos^2 x \Rightarrow 2 \operatorname{sen}^2 x + \cos^2 x - \operatorname{sen}^2 x = 4 \cos^2 x \Rightarrow \operatorname{sen}^2 x + \cos^2 x = 4 \cos^2 x \Rightarrow 1 = 4 \cos^2 x \Rightarrow$

$\Rightarrow \cos^2 x = \dfrac{1}{4} \Rightarrow \cos x = \pm \dfrac{1}{2} \Rightarrow \begin{cases} x = 60^\circ,\ x = 300^\circ \\ x = 120^\circ,\ x = 240^\circ \end{cases}$

6.-

a) $\operatorname{sen}^2 x + \operatorname{tg}^2 x = 0 \Rightarrow \operatorname{sen}^2 x \left(1 + \dfrac{1}{\cos^2 x}\right) = 0 \Rightarrow \begin{cases} \operatorname{sen}^2 x = 0 \Rightarrow \operatorname{sen} x = 0 \Rightarrow x = 0,\ x = \pi,\ x = 2\pi \\ 1 + \dfrac{1}{\cos^2 x} = 0 \text{ no aporta soluciones} \end{cases}$

b) $2 \operatorname{sen} x + \sqrt{3} \cdot \operatorname{tg} x = 0 \Rightarrow 2 \operatorname{sen} x + \sqrt{3} \cdot \dfrac{\operatorname{sen} x}{\cos x} = 0 \Rightarrow \operatorname{sen} x \left(2 + \dfrac{\sqrt{3}}{\cos x}\right) = 0 \Rightarrow \begin{cases} \operatorname{sen} x = 0 \Rightarrow x = 0,\ x = \pi,\ x = 2\pi \\ \cos x = -\dfrac{\sqrt{3}}{2} \Rightarrow x = \dfrac{5\pi}{6}\ ,\ x = \dfrac{7\pi}{6} \end{cases}$

c) $\cos 2x - \operatorname{sen} x = \operatorname{sen} 2x - \cos x \Rightarrow \cos 2x + \cos x = \operatorname{sen} 2x + \operatorname{sen} x \Rightarrow 2 \cos \dfrac{3x}{2} \cos \dfrac{x}{2} = 2 \operatorname{sen} \dfrac{3x}{2} \cos \dfrac{x}{2} \Rightarrow$

$\Rightarrow \cos \dfrac{x}{2} \left[\cos \dfrac{3x}{2} - \operatorname{sen} \dfrac{3x}{2}\right] = 0 \Rightarrow \begin{cases} \cos \dfrac{x}{2} = 0 \Rightarrow \dfrac{x}{2} = \dfrac{\pi}{2}\ ;\ \dfrac{x}{2} = \dfrac{3\pi}{2} \Rightarrow x = \pi,\ x = 3\pi \\ \operatorname{tg} \dfrac{3x}{2} = 1 \Rightarrow \dfrac{3x}{2} = \dfrac{\pi}{4}\ :\ \dfrac{3x}{2} = \dfrac{5\pi}{4} \Rightarrow x = \dfrac{\pi}{6},\ x = \dfrac{5\pi}{6} \end{cases}$

7.-

a) $\operatorname{sen} 3x + \operatorname{sen} 6x = 0 \Rightarrow 2 \operatorname{sen} \dfrac{9x}{2} \cos \dfrac{3x}{2} = 0 \Rightarrow \begin{cases} \operatorname{sen} \dfrac{9x}{2} = 0 \Rightarrow x = 0,\ x = -\dfrac{2\pi}{9},\ x = \dfrac{2\pi}{9} \\ \cos \dfrac{3x}{2} = 0 \Rightarrow x = \pi,\ x = -\dfrac{\pi}{3},\ x = \dfrac{\pi}{3} \end{cases}$

b) $\cos 5x + \cos 3x = \cos x \Rightarrow 2 \cos 4x \cos x = \cos x \Rightarrow \cos x\, (2 \cos 4x - 1) = 0 \Rightarrow$

$$\Rightarrow \begin{cases} \cos x = 0 \Rightarrow x = \dfrac{\pi}{2},\ x = -\dfrac{\pi}{2} \\ \cos 4x = \dfrac{1}{2} \Rightarrow x = \dfrac{5\pi}{12},\ x = \dfrac{\pi}{12},\ x = \dfrac{\pi}{12} \end{cases}$$

c) $\sqrt{3} \cos x + \operatorname{sen} x = 2 \Rightarrow \dfrac{\sqrt{3}}{2} \cos x + \dfrac{1}{2} \operatorname{sen} x = 1 \Rightarrow \operatorname{sen} \left(x + \dfrac{\pi}{3}\right) = 1 \Rightarrow x = \dfrac{\pi}{6}$

8.-

$\operatorname{sen}^4 x - \cos^4 x = \dfrac{1}{2} \Rightarrow (\operatorname{sen}^2 x - \cos^2 x)(\operatorname{sen}^2 x + \cos^2 x) = \dfrac{1}{2} \Rightarrow \operatorname{sen}^2 x - \cos^2 x = \dfrac{1}{2} \Rightarrow -\cos 2x = \dfrac{1}{2} \Rightarrow \cos 2x = -\dfrac{1}{2}$

Soluciones: $2x = 120^\circ + 360^\circ k \Rightarrow x = 60^\circ + 180^\circ k$

$2x = 240^\circ + 360^\circ k \Rightarrow x = 120^\circ + 180^\circ k$

9.-

a) $\cos x\, tg\, x = \frac{1}{2} \rightarrow sen\, x = \frac{1}{2} \rightarrow \begin{cases} x_1 = 30° + 360° \cdot k \\ x_2 = 150° + 360° \cdot k \end{cases}$

b) $\cos 2x + sen\, 2x = 1 \rightarrow \cos^2 x - sen^2 x + 2\, sen\, x \cdot \cos x = \cos^2 x + sen^2 x$

$\rightarrow -2\, sen^2 x + 2\, sen\, x \cdot \cos x = 0 \rightarrow 2\, sen\, x\,(-sen\, x + \cos x) = 0$

$sen\, x = 0 \rightarrow \begin{cases} x_1 = 0° + 360° \cdot k \\ x_2 = 180° + 360° \cdot k \end{cases}$

$sen\, x = \cos x \rightarrow \begin{cases} x_1 = 45° + 360° \cdot k \\ x_2 = 225° + 360° \cdot k \end{cases}$

c) $\cos 2x - sen\, 2x = 0 \rightarrow \cos 2x = sen\, 2x \rightarrow \begin{cases} x_1 = 22{,}5° + 180° \cdot k \\ x_2 = 112{,}5° + 180° \cdot k \end{cases}$

d) $sen\, 2x + \cos x = (2\, sen\, x + 1)\cos x = 0 \rightarrow \begin{cases} x_1 = 90° + 360° \cdot k \quad x_3 = 210° + k \cdot 360° \\ x_2 = 270° + 360° \cdot k \quad x_4 = 330° + k \cdot 360° \end{cases}$

e) $sen\, 2x + sen\, 2x = 0 \rightarrow 2\, sen\, 2x = 0 \rightarrow \begin{cases} x_1 = 0° + 180° \cdot k \\ x_2 = 90° + 180° \cdot k \end{cases}$

f) $tg\, x + sen\, x = 0 \rightarrow sen\, x \left(\frac{1}{\cos x} + 1 \right) = 0$

$sen\, x = 0 \rightarrow \begin{cases} x_1 = 0° + 360° \cdot k \\ x_2 = 180° + 360° \cdot k \end{cases}$

$\frac{1}{\cos x} + 1 = 0 \rightarrow x_3 = 180° + 360° \cdot k$

g) $tg\, x - sen\, 2x = 0 \rightarrow \frac{sen\, x}{\cos x} - 2\, sen\, x \cdot \cos x = 0 \rightarrow sen\, x(1 - 2\cos^2 x) = 0$

$sen\, x = 0 \rightarrow \begin{cases} x_1 = 0° + 360° \cdot k \\ x_2 = 180° + 360° \cdot k \end{cases}$

$1 - 2\cos^2 x = 0 \rightarrow \cos x = \sqrt{\frac{1}{2}} \rightarrow x_3 = 45° + 360° \cdot k$

h) $\frac{sen\,(60° - x)}{\cos x} = 1 \rightarrow \frac{\sqrt{3}\, \cos x - sen\, x}{2 \cos x} = 1 \rightarrow \sqrt{3} - tg\, x = 2$

$\rightarrow tg\, x = -0{,}2679 \rightarrow x = 345° + 360° \cdot k$

i) $tg\left(\frac{\pi}{4} - x \right) + tg\, x - 1 = 0 \rightarrow \frac{1 - tg\, x}{1 + tg\, x} + tg\, x - 1 = 0$

$\rightarrow tg^2 x - tg\, x = 0 \rightarrow tg\, x(tg\, x - 1) = 0$

$tg\, x = 0 \rightarrow \begin{cases} x_1 = 0° + 360° \cdot k \\ x_2 = 180° + 360° \cdot k \end{cases}$

$tg\, x - 1 = 0 \rightarrow tg\, x = 1 \rightarrow \begin{cases} x_1 = 45° + 360° \cdot k \\ x_2 = 225° + 360° \cdot k \end{cases}$

j) $\text{sen}\,(x+30°)+\cos\,(x+60°)=1+\cos 2x$

$$\rightarrow \frac{\sqrt{3}\ \text{sen}\ x}{2}+\frac{\cos\ x}{2}+\frac{\cos\ x}{2}-\frac{\sqrt{3}\ \text{sen}\ x}{2}=$$

$$=\cos^2 x+\text{sen}^2 x+\cos^2 x-\text{sen}^2 x\rightarrow \cos x=2\cos^2 x\rightarrow \cos x(2\cos x-1)=0$$

$$\cos x=0\rightarrow \begin{cases} x_1=90°+360°\cdot k \\ x_2=270°+360°\cdot k \end{cases}$$

$$2\cos x-1=0\rightarrow \cos x=\frac{1}{2}\rightarrow \begin{cases} x_1=60°+360°\cdot k \\ x_2=300°+360°\cdot k \end{cases}$$

10.-

a) $4\,\text{sen}\,x-\sec x=0\rightarrow 4\,\text{sen}\,x\cdot\cos x-1=0\rightarrow 2\,\text{sen}\,2x=1\rightarrow \text{sen}\,2x=\frac{1}{2}$

$$\rightarrow \begin{cases} x_1=15°+180°\cdot k \\ x_2=75°+180°\cdot k \end{cases}$$

b) $\frac{\cos^2 x}{2\cos x+\text{sen}\,x}=\text{sen}\,x\rightarrow \cos^2 x=2\cos x\cdot\text{sen}\,x+\text{sen}^2 x\rightarrow \cos 2x=\text{sen}\,2x$

$$\rightarrow \begin{cases} x_1=22{,}5°+180°\cdot k \\ x_2=112{,}5°+180°\cdot k \end{cases}$$

c) $\frac{1}{\cos x+\text{sen}\,x}+2\,\text{sen}\,x=2\cos x\rightarrow \frac{2\,\text{sen}\,x\cdot\cos x+2\,\text{sen}^2 x}{2\cos^2 x+2\,\text{sen}\,x\cdot\cos x}=1$

$$\rightarrow \frac{\text{sen}\,x(\cos x+\text{sen}\,x)}{\cos x(\cos x+\text{sen}\,x)}=1\rightarrow \text{tg}\,x=1\rightarrow \begin{cases} x_1=45°+360°\cdot k \\ x_2=225°+360°\cdot k \end{cases}$$

d) $\text{sen}\,x\,(\text{sen}\,x-1)=5\cos^2 x-4\rightarrow \text{sen}^2 x-\text{sen}\,x=5(1-\text{sen}^2 x)-4$

$6\,\text{sen}^2 x-\text{sen}\,x-1=0$

$$\rightarrow \text{sen}\,x=-\frac{1}{3}\rightarrow \begin{cases} x_1=340°\ 31'\ 44''+360°\cdot k \\ x_2=199°\ 28'\ 16''+360°\cdot k \end{cases}$$

$$\rightarrow \text{sen}\,x=\frac{1}{2}\rightarrow \begin{cases} x_1=30°+360°\cdot k \\ x_2=150°+360°\cdot k \end{cases}$$

e) $2\cos x-1=\sec x\rightarrow 2\cos^2 x-\cos x-1=0$

$$\rightarrow \cos x=1\rightarrow \begin{cases} x_1=0°+360°\cdot k \\ x_2=180°+360°\cdot k \end{cases}$$

$$\rightarrow \cos x=-\frac{1}{2}\rightarrow \begin{cases} x_1=120°+360°\cdot k \\ x_2=240°+360°\cdot k \end{cases}$$

f) $2\cos x+\text{sen}\,x=1\rightarrow \sqrt{1-\cos^2 x}=1-2\cos x\rightarrow 5\cos^2 x-4\cos x=0$

$$\rightarrow \cos x(5\cos x-4)=0\rightarrow \cos x=\frac{4}{5}\rightarrow \begin{cases} x_1=36°\ 52'\ 11{,}6''+360°\cdot k \\ x_2=323°\ 7'\ 48{,}4''+360°\cdot \end{cases}$$

g) $\text{sen}\,x+\cos x=0\rightarrow \text{sen}\,x=-\cos x\rightarrow \begin{cases} x_1=135°+360°\cdot k \\ x_2=315°+360°\cdot k \end{cases}$