

## Soluciones de ecuaciones trigonométricas II

## Ejercicio 10 resuelto

$$\operatorname{tg} 2x = -\operatorname{tg} x$$

$$\frac{2\operatorname{tg} x}{1 - \operatorname{tg}^2 x} = -\operatorname{tg} x$$

$$\operatorname{tg} x (\operatorname{tg}^2 x - 3) = 0$$

$$\operatorname{tg} x = 0 \quad x = 0^\circ + 180^\circ k$$

$$\operatorname{tg} x = \pm\sqrt{3} \quad \begin{cases} x = 60^\circ + 180^\circ k \\ x = 120^\circ + 180^\circ k \end{cases}$$

## Ejercicio 11 resuelto

$$\operatorname{sen} x + \sqrt{3} \cos x = 2$$

$$\operatorname{sen} x + \sqrt{3} \cos x = 2 \quad \frac{1}{2} \operatorname{sen} x + \frac{\sqrt{3}}{2} \cos x = 1$$

$$\operatorname{sen}(x + 60^\circ) = 1 \quad x + 60^\circ = 90^\circ + 360^\circ k$$

$$x = 30^\circ + 360^\circ k$$

## Ejercicio 12 resuelto

$$\operatorname{sen} 2x = \cos 60^\circ$$

$$\begin{aligned} \operatorname{sen} 2x &= \cos 60^\circ & \operatorname{sen} 2x &= \frac{1}{2} \end{aligned}$$

$$\begin{cases} 2x = 30^\circ + 360^\circ k & x = 15^\circ + 180^\circ k \\ 2x = 150^\circ + 360^\circ k & x = 75^\circ + 180^\circ k \end{cases}$$


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### Ejercicio 13 resuelto

$$4\operatorname{sen}(x - 30^\circ)\cos(x - 30^\circ) = \sqrt{3}$$

$$2[2\operatorname{sen}(x - 30^\circ)\cos(x - 30^\circ)] = \sqrt{3}$$

$$\operatorname{sen} 2(x - 30^\circ) = \frac{\sqrt{3}}{2}$$

$$2(x - 30^\circ) = 60^\circ + 360^\circ k \quad x = 60^\circ + 180^\circ k$$

$$2(x - 30^\circ) = 120^\circ + 360^\circ k \quad x = 90^\circ + 180^\circ k$$


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### Ejercicio 14 resuelto

$$2\cos x = 3\operatorname{tg} x$$

$$2\cos x = \frac{3\operatorname{sen} x}{\cos x} \quad 2\cos^2 x = 3\operatorname{sen} x$$

$$2(1 - \operatorname{sen}^2 x) = 3\operatorname{sen} x \quad 2 - 2\operatorname{sen}^2 x = 3\operatorname{sen} x$$

$$2\operatorname{sen}^2 x + 3\operatorname{sen} x - 2 = 0$$

$$\operatorname{sen} x = \frac{-3 \pm \sqrt{9 + 16}}{4} = \frac{-3 \pm 5}{4}$$

$$\operatorname{sen} x = \frac{1}{2} \Rightarrow \begin{cases} x_1 = 30^\circ + 360^\circ k \\ x_2 = 150^\circ + 360^\circ k \end{cases}$$

$\operatorname{sen} x = -2$  Sin solución porque  $-1 \leq \operatorname{sen} x \leq 1$

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### Ejercicio 15 resuelto

$$\operatorname{sen} 2x \cdot \cos x = 6 \operatorname{sen}^3 x$$

$$2 \operatorname{sen} x \cdot \cos x \cdot \cos x = 6 \operatorname{sen}^3 x$$

$$\operatorname{sen} x (\cos^2 x - 3 \operatorname{sen}^2 x) = 0$$

$$\operatorname{sen} x = 0 \Rightarrow \begin{cases} x = 0^\circ + 360^\circ k \\ x = 180^\circ + 360^\circ k \end{cases} \Rightarrow x = 0^\circ + 180^\circ k$$

$$\cos^2 x - 3 \operatorname{sen}^2 x = 0 \qquad \cos^2 x = 3 \operatorname{sen}^2 x$$

$$\operatorname{tg}^2 x = \frac{1}{3} \qquad \operatorname{tg} x = \pm \frac{\sqrt{3}}{3}$$

$$\operatorname{tg} x = \frac{\sqrt{3}}{3} \Rightarrow x = 30^\circ + 180^\circ k$$

$$\operatorname{tg} x = -\frac{\sqrt{3}}{3} \Rightarrow x = 150^\circ + 180^\circ k$$


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### Ejercicio 16 resuelto

$$4 \operatorname{sen} \frac{x}{2} + 2 \cos x = 3$$

$$4 \operatorname{sen} \frac{x}{2} + 2 \left( \cos^2 \frac{x}{2} - \operatorname{sen}^2 \frac{x}{2} \right) = 3$$

$$4\operatorname{sen} \frac{x}{2} + 2\cos^2 \frac{x}{2} - 2\operatorname{sen}^2 \frac{x}{2} = 3$$

$$4\operatorname{sen} \frac{x}{2} + 2\left(1 - \operatorname{sen}^2 \frac{x}{2}\right) - 2\operatorname{sen}^2 \frac{x}{2} = 3$$

$$4\operatorname{sen}^2 \frac{x}{2} - 4\operatorname{sen} \frac{x}{2} + 1 = 0$$

$$\left(2\operatorname{sen} \frac{x}{2} - 1\right)^2 = 0 \qquad 2\operatorname{sen} \frac{x}{2} - 1 = 0$$

$$\operatorname{sen} \frac{x}{2} = \frac{1}{2} \begin{cases} \frac{x}{2} = 30^\circ + 360^\circ k & x = 60^\circ + 360^\circ k \\ \frac{x}{2} = 150^\circ + 360^\circ k & x = 300^\circ + 360^\circ k \end{cases}$$

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