

12.-  $\cos 2x - \cos 6x = \operatorname{sen} 5x + \operatorname{sen} 3x$

Recuerda:  $\operatorname{sen} A + \operatorname{sen} B = 2 \operatorname{sen} \frac{A+B}{2} \cos \frac{A-B}{2}$

$$\cos A - \cos B = -2 \operatorname{sen} \frac{A+B}{2} \operatorname{sen} \frac{A-B}{2}$$

$$-2 \operatorname{sen} \frac{2x+6x}{2} \operatorname{sen} \frac{2x-6x}{2} = 2 \operatorname{sen} \frac{5x+3x}{2} \cos \frac{5x-3x}{2}$$

$$-2 \operatorname{sen} 4x \operatorname{sen} (-2x) = 2 \operatorname{sen} 4x \cos x$$

$$-2 \operatorname{sen} 4x (-\operatorname{sen} 2x) = 2 \operatorname{sen} 4x \cos x$$

$$2 \operatorname{sen} 4x \operatorname{sen} 2x = 2 \operatorname{sen} 4x \cos x$$

$$2 \operatorname{sen} 4x (\operatorname{sen} 2x - \cos x) = 0$$

$$\operatorname{sen} 4x = 0 \Rightarrow 4x = 0^\circ + 180^\circ \cdot k \Rightarrow x_1 = 0^\circ + 45^\circ \cdot k$$

$$\operatorname{sen} 2x - \cos x = 0; 2 \operatorname{sen} x \cos x - \cos x = 0; \cos x (2 \operatorname{sen} x - 1) = 0$$

$$\cos x = 0 \Rightarrow x_2 = 90^\circ + 180^\circ \cdot k$$

$$2 \operatorname{sen} x - 1 = 0; 2 \operatorname{sen} x = 1;$$

$$\operatorname{sen} x = \frac{1}{2} \Rightarrow \begin{cases} x_3 = 30^\circ + 360^\circ \cdot k \\ x_4 = 150^\circ + 360^\circ \cdot k \end{cases}$$

13.-  $3 \operatorname{tg} x = 2 \cos x$

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

$$3 \operatorname{sen} x - 2(1 - \operatorname{sen}^2 x) = 0; 3 \operatorname{sen} x - 2 + 2 \operatorname{sen}^2 x = 0; 2 \operatorname{sen}^2 x + 3 \operatorname{sen} x - 2 = 0$$

$$\operatorname{sen} x = \frac{1}{2} \text{ (la otra solución, } \operatorname{sen} x = -2, \text{ no es válida, porque } -1 \leq \operatorname{sen} x \leq +1)$$

$$x_1 = 30^\circ + 360^\circ \cdot k; x_2 = 150^\circ + 360^\circ \cdot k$$

14.-  $\operatorname{sen} 2x \cos x = 6 \operatorname{sen}^3 x$

$$2 \operatorname{sen} x \cos x \cos x - 6 \operatorname{sen}^3 x = 0; 2 \operatorname{sen} x (\cos^2 x - 3 \operatorname{sen}^2 x) = 0;$$

$$\operatorname{sen} x = 0 \Rightarrow x_1 = 0^\circ + 180^\circ \cdot k$$

$$\cos^2 x - 3 \operatorname{sen}^2 x = 0; 1 - \operatorname{sen}^2 x - 3 \operatorname{sen}^2 x = 0; 1 - 4 \operatorname{sen}^2 x = 0; \operatorname{sen}^2 x = \frac{1}{4}; \operatorname{sen} x = \pm \frac{1}{2}$$

$$\operatorname{sen} x = \frac{1}{2} \Rightarrow \begin{cases} x_2 = 30^\circ + 360^\circ \cdot k \\ x_3 = 150^\circ + 360^\circ \cdot k \end{cases}$$

$$\operatorname{sen} x = -\frac{1}{2} \Rightarrow \begin{cases} x_4 = 210^\circ + 360^\circ \cdot k \\ x_5 = 330^\circ + 360^\circ \cdot k \end{cases}$$

15.-  $6 \cos^2 \frac{x}{2} + \cos x + 1 = 0$

$$6 \left( \frac{1 + \cos x}{2} \right) + \cos x + 1 = 0; 3 + 3 \cos x + \cos x + 1 = 0; 4 \cos x + 4 = 0;$$

$$\cos x = -1 \Rightarrow x = 180^\circ + 360^\circ \cdot k$$