

$$a) 3x^4 - 15x^2 + 12 = 0$$

$$t = x^2 \quad 3t^2 - 15t + 12 = 0$$

$$t^2 = x^4 \quad t^2 - 5t + 4 = 0$$

$$t = \frac{5 \pm \sqrt{25 - 16}}{2 \cdot 1} = \frac{5 \pm 3}{2} = \begin{cases} t_1 = 4 \\ t_2 = 1 \end{cases}$$

$$\text{Para } t_1 = 4$$

$$x^2 = 4$$

$$x_1 = +2$$

$$x_2 = -2$$

$$\text{Para } t_2 = 1$$

$$x^2 = 1$$

$$x_3 = 1$$

$$x_4 = -1$$

$$\text{Soluciones } \left\{ \begin{array}{l} x_1 = 2 \\ x_2 = -2 \\ x_3 = 1 \\ x_4 = -1 \end{array} \right.$$

$$b) x(9x^2 - 1)(2x + 3) = 0$$

$$x_1 = 0$$

$$9x^2 - 1 = 0 \Rightarrow x^2 = \frac{1}{9} \Rightarrow x = \pm \sqrt{\frac{1}{9}} \quad \left\{ \begin{array}{l} x_2 = \frac{1}{3} \\ x_3 = -\frac{1}{3} \end{array} \right.$$

$$2x + 3 = 0 \Rightarrow x_4 = -\frac{3}{2}$$

$$\text{Soluciones } \left\{ \begin{array}{l} x_1 = 0 \\ x_2 = \frac{1}{3} \\ x_3 = -\frac{1}{3} \\ x_4 = -\frac{3}{2} \end{array} \right.$$

$$c) \sqrt{x+4} + \sqrt{x-1} = 5$$

$$\left(\sqrt{x+4}\right)^2 = \left(5 - \sqrt{x-1}\right)^2$$

$$x+4 = 25 - 10\sqrt{x-1} + (x-1)$$

$$\cancel{x}+4 - 25 - \cancel{x} + 1 = -10\sqrt{x-1}$$

$$\frac{-20}{-10} = \sqrt{x-1}$$

$$2^2 = \left(\sqrt{x-1}\right)^2$$

$$4 = x - 1$$

$$\boxed{x = 5}$$

Comprobar:

$$\sqrt{5+4} + \sqrt{5-1} = 5$$

$$3 + 2 = 5$$

$$5 = 5$$

Solución  $\boxed{x = 5}$

$$c) x^3 + 3x^2 + 4x + 12 = 0$$

$$\begin{array}{r|rrrr} -3 & 1 & 3 & 4 & 12 \\ & & -3 & 0 & \div 12 \\ \hline & 1 & 0 & 4 & 0 \end{array}$$

$$x_1 = -3$$

$$x^2 + 4 = 0$$

$$x^2 = -4 \Rightarrow x^2 = \pm \sqrt{-4} \Rightarrow x = \pm 2i$$

Soluciones  $x_1 = -3$   
 $x_2 = +2i$   
 $x_3 = -2i$

d)  $\log(2x+3) - \log(x-1) = 2\log 2 + 2\log 3$

$$\log \frac{(2x+3)}{(x-1)} = \log 2^2 + \log 3^2$$

$$\log \frac{2x+3}{x-1} = \log 4 \cdot 9$$

$$\frac{2x+3}{x-1} = 36$$

$$2x+3 = 36x - 36$$

$$3 + 36 = 36x - 2x$$

$$39 = 34x$$

$$x = \frac{39}{34}$$

$x = \frac{39}{34}$  sí es solución

$$\log \left[ 2 \left( \frac{39}{34} \right) + 3 \right] - \log \left( \frac{39}{34} - 1 \right) = 2\log 2 + 2\log 3$$

$$\log \left[ \frac{39}{17} + \frac{51}{17} \right] - \log \left( \frac{39}{34} - \frac{34}{34} \right) = \log 36$$

$$\log \left[ \frac{90}{17} \right] - \log \left( \frac{5}{34} \right) = \log 36$$

$$\log \frac{90/17}{5/34} = \log 36$$

$$\log \frac{90 \cdot 34}{5 \cdot 17} = \log 36$$

$$\log 36 = \log 36$$

