

M03
P1

$$3^x \cdot 4^{2x+1} = 6^{x+2}$$

$$\ln 3^x \cdot 4^{2x+1} = \ln 6^{x+2}; \quad x \ln 3 + (2x+1) \ln 4 = (x+2) \ln 6; \quad x \ln 3 + 2x \ln 4 + \ln 4 = x \ln 6 + 2 \ln 6;$$

$$x (\ln 3 + 2 \ln 4 - \ln 6) = 2 \ln 6 - \ln 4; \quad x = \frac{2 \ln 6 - \ln 4}{\ln 3 + 2 \ln 4 - \ln 6} = \frac{\ln(6^2/4)}{\ln(3 \cdot 4^2)} = \boxed{\frac{\ln 9}{\ln 8}} \quad \begin{matrix} a=9 \\ b=8 \end{matrix}$$

N03
P1

$$2 \cdot 5^{x+1} = 1 + \frac{3}{5^x}$$

$$2 \cdot 5^x \cdot 5 = 1 + \frac{3}{5^x}$$

$$t = 5^x \rightarrow 10t = 1 + \frac{3}{t}; \quad 10t^2 = t + 3; \quad 10t^2 - t - 3 = 0$$

$$t = \frac{1 \pm \sqrt{1+120}}{20} = \frac{1 \pm 11}{20} \quad \begin{matrix} \frac{12}{20} = \frac{3}{5} \\ -\frac{10}{20} = -\frac{1}{2} \end{matrix}$$

$$t = \frac{3}{5} \Rightarrow 5^x = \frac{3}{5}; \quad x = \log_5 \frac{3}{5} = \log_5 3 - \log_5 5 = \boxed{\log_5 3 - 1} \quad \begin{matrix} a=-1 \\ b=3 \end{matrix}$$

$$t = -\frac{1}{2} \Rightarrow 5^x = -\frac{1}{2}; \quad \text{Absurdo}$$

N03
P1

$$\log_{16} \sqrt[3]{100-x^2} = \frac{1}{2}$$

$$\sqrt[3]{100-x^2} = 16^{1/2}; \quad \sqrt[3]{100-x^2} = 4; \quad 100-x^2 = 64; \quad x^2 = 36; \quad \boxed{x = \pm 6}$$

M05
P1

$$2 \log_3 (x-3) + \log_{1/3} (x+1) = 2$$

$$2 \log_3 (x-3) + \frac{\log_3 (x+1)}{\log_3 (1/3)} = 2; \quad 2 \log_3 (x-3) + \frac{\log_3 (x+1)}{-1} = 2; \quad \log_3 (x-3)^2 - \log_3 (x+1) = 2;$$

$$\log_3 \frac{(x-3)^2}{x+1} = 2; \quad \frac{(x-3)^2}{x+1} = 3^2; \quad (x-3)^2 = 9(x+1); \quad x^2 - 6x + 9 = 9x + 9;$$

$$x^2 - 15x = 0; \quad x(x-15) = 0 \Rightarrow x = \boxed{15} \quad \text{No estaria definido } \log_3 (x-3)$$

M06
P1

$$|\ln(x+3)| = 1$$

$$\ln(x+3) = \begin{matrix} \rightarrow 1 \\ \rightarrow -1 \end{matrix} \Rightarrow \begin{matrix} x+3 = e^1 \\ x+3 = e^{-1} \end{matrix}; \quad \boxed{\begin{matrix} x = e-3 \\ x = e^{-1}-3 \end{matrix}}$$

N06
P1

$$9 \log_5 x = 25 \log_x 5$$

$$9 \log_5 x = 25 \frac{\log_5 5}{\log_5 x}; \quad (\log_5 x)^2 = \frac{25 \cdot \log_5 5}{9}; \quad (\log_5 x)^2 = \frac{25}{9}; \quad \log_5 x = \pm \sqrt{\frac{25}{9}};$$

$$\log_5 x = \begin{matrix} \rightarrow 5/3 \\ \rightarrow -5/3 \end{matrix} \Rightarrow \boxed{\begin{matrix} x = 5^{5/3} \\ x = 5^{-5/3} \end{matrix}}$$

M07
P1

$$2^{2x+3} = 2^{x+1} + 3$$

$$2^{2x} \cdot 2^3 = 2^x \cdot 2 + 3$$

$$t = 2^x \rightarrow t^2 \cdot 8 = t \cdot 2 + 3; \quad 8t^2 - 2t - 3 = 0; \quad t = \frac{2 \pm \sqrt{4+96}}{16} = \frac{2 \pm 10}{16} \quad \begin{matrix} \frac{12}{16} = \frac{3}{4} \\ -\frac{8}{16} = -\frac{1}{2} \end{matrix}$$

$$t = \frac{3}{4} \Rightarrow 2^x = \frac{3}{4}; \quad x = \log_2 \left(\frac{3}{4}\right) = \log_2 3 - \log_2 4 = \boxed{\log_2 3 - 2} \quad \begin{matrix} a=-2 \\ b=3 \end{matrix}$$

$$t = -\frac{1}{2} \Rightarrow 2^x = -\frac{1}{2}; \quad \text{Absurdo}$$

1107
P1

$$2(\ln x)^2 = 3\ln x - 1$$

$$t = \ln x \rightarrow 2t^2 = 3t - 1 ; 2t^2 - 3t + 1 = 0 ; t = \frac{3 \pm \sqrt{9-8}}{4} = \frac{3 \pm 1}{4} < \frac{1}{2}$$

$$t = 1 \Rightarrow \ln x = 1 ; \boxed{x = e}$$

$$t = 1/2 \Rightarrow \ln x = 1/2 ; \boxed{x = e^{1/2}}$$

1107
P1

$$a) 2 \cdot 4^x + 4^{-x} = 3 ; 2 \cdot 4^x + \frac{1}{4^x} = 3$$

$$t = 4^x \rightarrow 2t + \frac{1}{t} = 3 ; 2t^2 + 1 = 3t ; 2t^2 - 3t + 1 = 0 ;$$

$$t = \frac{3 \pm \sqrt{9-8}}{4} = \frac{3 \pm 1}{4} < \frac{1}{2}$$

$$t = 1 \Rightarrow 4^x = 1 ; \boxed{x = 0}$$

$$t = 1/2 \Rightarrow 4^x = \frac{1}{2} ; (2^2)^x = 2^{-1} ; 2^{2x} = 2^{-1} ; 2x = -1 ; \boxed{x = -1/2}$$

$$b) a^x = e^{2x+1}$$

$$\ln a^x = \ln e^{2x+1} ; x \cdot \ln a = (2x+1) \cdot \ln e ; x \ln a = 2x+1 ; x(\ln a - 2) = 1$$

$$\boxed{x = \frac{1}{\ln a - 2}}$$

$$\text{No finite solution if } \ln a - 2 = 0 ; \ln a = 2 ; \boxed{a = e^2}$$

Muestra 08
P1

$$2^{2x+2} - 10 \cdot 2^x + 4 = 0$$

$$2^{2x} \cdot 2^2 - 10 \cdot 2^x + 4 = 0$$

$$t = 2^x \rightarrow t^2 \cdot 4 - 10 \cdot t + 4 = 0 ; 4t^2 - 10t + 4 = 0 ; 2t^2 - 5t + 2 = 0$$

$$t = \frac{5 \pm \sqrt{25-16}}{4} = \frac{5 \pm 3}{4} < \frac{2}{1/2}$$

$$t = 2 \Rightarrow 2^x = 2 ; \boxed{x = 1}$$

$$t = \frac{1}{2} \Rightarrow 2^x = \frac{1}{2} ; 2^x = 2^{-1} ; \boxed{x = -1}$$

Muestra 08
P1

$$\log_3(x+17) - 2 = \log_3 2x$$

$$\log_3(x+17) - \log_3 2x = 2 ; \log_3 \frac{x+17}{2x} = 2 ; \frac{x+17}{2x} = 3^2 ; x+17 = 18x ; -17x = -17 ; \boxed{x = 1}$$

Muestra 08
P1

$$4 \ln 2 - 3 \ln 4 = -\ln K$$

$$\ln 2^4 - \ln 4^3 = \ln K^{-1}$$

$$\ln \frac{2^4}{4^3} = \ln \frac{1}{K} \rightarrow \frac{2^4}{4^3} = \frac{1}{K} ; \boxed{K = 4}$$

1108
P1

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

$$= \ln \frac{(x+1)(x-1)x(x+1)}{(x+1)^2} = \boxed{\ln x(x-1)}$$

1109
P1

$$g(x) = \log_5 |2 \log_3 x|$$

$$g(x) = 0 \Rightarrow \log_5 |2 \log_3 x| = 0 \Rightarrow |2 \log_3 x| = 1 \Rightarrow 2 \log_3 x = \pm 1 ;$$

$$\log_3 x = \pm 1/2 \rightarrow x = 3^{\pm 1/2}$$

$$x_1 = \sqrt{3}$$

$$x_2 = \frac{1}{\sqrt{3}}$$

$$\rightarrow x_1 \cdot x_2 = \sqrt{3} \cdot \frac{1}{\sqrt{3}} = \boxed{1}$$

N10
P2

$$a) \ln 2^{4x-1} = \ln 8^{x+5} + \log_2 16^{1-2x}$$

$$\ln 2^{4x-1} = \ln(2^3)^{x+5} + \frac{\ln(2^4)^{1-2x}}{\ln 2}$$

$$(4x-1)\ln 2 = 3(x+5)\ln 2 + \frac{4(1-2x)\ln 2}{\cancel{\ln 2}}$$

$$4x\ln 2 - \ln 2 = 3x\ln 2 + 15\ln 2 + 4 - 8x$$

$$x(4\ln 2 - 3\ln 2 + 8) = 15\ln 2 + 4 + \ln 2 ; x \cdot (\ln 2 + 8) = 16\ln 2 + 4 ; \boxed{x = \frac{16\ln 2 + 4}{\ln 2 + 8}}$$

$$b) \log_a \frac{16\ln 2 + 4}{\ln 2 + 8} = 2 \rightarrow a^2 = \frac{16\ln 2 + 4}{\ln 2 + 8}$$

$$a = \pm \sqrt{\frac{16\ln 2 + 4}{\ln 2 + 8}} = \begin{cases} 1.318 \\ -1.318 \end{cases}$$

La base de un logaritmo no puede ser negativa

N10
P1

$$4^{x-1} = 2^x + 8$$

$$\frac{4^x}{4} = 2^x + 8$$

$$t = 2^x \rightarrow \frac{t^2}{4} = t + 8 ; t^2 = 4t + 32 ; t^2 - 4t - 32 = 0 ; t = \frac{4 \pm \sqrt{16 + 128}}{2} = \frac{4 \pm 12}{2} \begin{cases} 8 \\ -4 \end{cases}$$

$$t = 8 \Rightarrow 2^x = 8 ; \boxed{x = 3}$$

$$t = -4 \Rightarrow 2^x = -4 \text{ Absurdo}$$

N10
P2

$$\ln \frac{x}{y} = 1$$

$$\ln x^3 + \ln y^2 = 5$$

$$\left. \begin{array}{l} \ln \frac{x}{y} = 1 \\ \ln x^3 + \ln y^2 = 5 \end{array} \right\} \rightarrow \left. \begin{array}{l} \ln x - \ln y = 1 \\ 3\ln x + 2\ln y = 5 \end{array} \right\} \begin{cases} a = \ln x \\ b = \ln y \end{cases}$$

$$a - b = 1$$

$$3a + 2b = 5$$

$$\begin{array}{r} -3a + 3b = -3 \\ 3a + 2b = 5 \\ \hline 5b = 2 \end{array}$$

$$b = \frac{2}{5}$$

$$\ln y = \frac{2}{5} \rightarrow y = e^{2/5}$$

$$\begin{array}{r} 2a - 2b = 2 \\ 3a + 2b = 5 \\ \hline 5a = 7 \end{array}$$

$$a = \frac{7}{5}$$

$$\ln x = \frac{7}{5}$$

$$x = e^{7/5}$$

$$\boxed{x = e^{7/5}, y = e^{2/5}}$$

$$; x^2 + 2x + 1 = x^4 - 1 ;$$

N11
P2

$$\log_{x+1} y = 2$$

$$\log_{y+1} x = \frac{1}{4}$$

$$(x+1)^2 = y$$

$$(y+1)^{1/4} = x$$

$$x^2 + 2x + 1 = y$$

$$y + 1 = x^4$$

$$y = (x^4 - 1)$$

$$0 = x^4 - x^2 - 2x - 2$$

$$\begin{array}{c|cccc} 1 & 0 & -1 & -2 & -2 \\ -1 & & -1 & 1 & 0 & 2 \\ \hline & 1 & -1 & 0 & -2 & 0 \end{array}$$

$$\Rightarrow \boxed{x = -1} \Rightarrow \boxed{y = 0}$$

$$x^3 - x^2 - 2 = 0 \rightarrow \boxed{x = 1.6956} \text{ (resuelto con calculadora gráfica)}$$

$$\hookrightarrow \boxed{y = 7.2660}$$

M12
P1 T21
#8

$$2 - \log_3(x+7) = \log_{\frac{1}{3}} 2x$$

$$2 - \log_3(x+7) = \frac{\log_3 2x}{\log_3 \frac{1}{3}}$$

$$2 - \log_3(x+7) = \frac{\log_3 2x}{-1}$$

$$2 = \log_3(x+7) - \log_3 2x$$

$$2 = \log_3 \frac{x+7}{2x} \Rightarrow \frac{x+7}{2x} = 3^2 ; \frac{x+7}{2x} = 9 ; x+7 = 18x ; \boxed{x = \frac{7}{17}}$$

N13
P1 #9

$$a) \log_2(x-2) = \log_4(x^2 - 6x + 12)$$

$$\log_2(x-2) = \frac{\log_2(x^2 - 6x + 12)}{\log_2 4}$$

$$\log_2(x-2) = \frac{\log_2(x^2 - 6x + 12)}{2}$$

$$2 \log_2(x-2) = \log_2(x^2 - 6x + 12)$$

$$\log_2(x-2)^2 = \log_2(x^2 - 6x + 12)$$

$$x^2 - 4x + 4 = x^2 - 6x + 12 ; 2x = 8 ; \boxed{x = 4}$$

$$b) x^{\ln x} = e^{(\ln x)^3}$$

$$\ln x^{\ln x} = (\ln x)^3$$

$$\ln x \cdot \ln x = (\ln x)^3$$

$$(\ln x)^2 = (\ln x)^3$$

$$0 = (\ln x)^3 - (\ln x)^2$$

$$0 = (\ln x)^2 \cdot [\ln x - 1] \Rightarrow \ln x = 0 \Rightarrow \boxed{x = 1}$$

$$\ln x = 1 \Rightarrow \boxed{x = e}$$

M14
P1 T21
#3

$$a = \log_2 3 \cdot \log_3 4 \cdot \log_4 5 \cdot \dots \cdot \log_{31} 32 =$$

$$= \frac{\log_2 3}{\log_2 2} \cdot \frac{\log_2 4}{\log_2 3} \cdot \frac{\log_2 5}{\log_2 4} \cdot \dots \cdot \frac{\log_2 32}{\log_2 31} = \log_2 32 = \boxed{5}$$

M14
P1 T22
#2

$$8^{x-1} = 6^{3x}$$

$$\ln 8^{x-1} = \ln 6^{3x} ; (x-1) \ln 8 = 3x \ln 6 ; x \ln 8 - 3x \ln 6 = \ln 8 ;$$

$$x(\ln 8 - 3 \ln 6) = \ln 8 ; x = \frac{\ln 8}{\ln 8 - 3 \ln 6} = \frac{\ln 8}{\ln \frac{8}{6^3}} = \frac{\ln 2^3}{\ln \frac{1}{3^3}} = \frac{3 \ln 2}{-3 \ln 3} = \boxed{-\frac{\ln 2}{\ln 3}}$$

M15
T22
P1 #9b

$$\log_x y = 4 \log_y x$$

$$\frac{\ln y}{\ln x} = 4 \frac{\ln x}{\ln y} \quad ; \quad (\ln y)^2 = 4 (\ln x)^2 \quad ; \quad \ln y = \pm 2 \ln x \quad ;$$

$$\cancel{\ln} y = \cancel{\ln} x^{\pm 2}$$

$$; \quad y = x^{\pm 2}$$

$$\begin{cases} y = x^2 \\ y = \frac{1}{x^2} \end{cases}$$

www.yoquieroaprobar.es