p89: 11

d) $3x^2 - 48 = 0$

$3x^2 = 48$

$x^2 = \frac{48}{3} = 16$

$x = \pm\sqrt{16} = \pm 4$

c) $5x^2 - 7x = 0$

$x(5x-7) = 0$

$x = 0$

$5x - 7 = 0$

$5x = 7$

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

e) $10x^2 + 9x = 5,2$

$10x^2 + 9x - 5,2 = 0$ (I)

Para quitar el decimal, multiplicamos por un número que haga se desaparezca. Lo más fácil será multiplicar por 10, pero eso nos llevaría después a simplificar toda la ec.:

(I) $\xrightarrow{\cdot 10}$ $100x^2 + 90x - 52 = 0$

$\xrightarrow{:2}$ $50x^2 + 45x - 26 = 0$

Si vemos que con multiplicar por 5 ya se quita el decimal, lo podemos hacer directamente:

(I) $\xrightarrow{\cdot 5}$ $50x^2 + 45x - 26 = 0$

Podríamos operar con el decimal, pero yo prefiero quitarlo.

$50x^2 + 45x - 26 = 0$

$x = \frac{-45 \pm \sqrt{2025 + 5200}}{100} = \frac{-45 \pm 85}{100}$

$\frac{-45+85}{100} = \frac{40}{100} = \frac{2}{5}$

$\frac{-45-85}{100} = \frac{-130}{100} = \frac{-13}{10}$

d) $6x^2 - x - 1 = 0$

$$x = \frac{1 \pm \sqrt{1+24}}{12} = \frac{1 \pm 5}{12} \begin{cases} \frac{6}{12} = \boxed{\frac{1}{2}} \\ \frac{-4}{12} = \boxed{\frac{-1}{3}} \end{cases}$$

f) $7x^2 - 3x + 4 = 0$

$$x = \frac{3 \pm \sqrt{9-112}}{14} = \frac{3 \pm \sqrt{-103}}{14}$$

~~✗~~ La raíz de un número negativo

↓

No tiene solución en $\mathbb{R}$

b) $3x^2 + 48 = 0$

$3x^2 = -48$

$x^2 = -\frac{48}{3} = -16$

$x = \pm \sqrt{-16}$ ~~✗~~ → No tiene solución en $\mathbb{R}$.

p89: 12

a) $7x^4 = 63x^2$

$7x^4 - 63x^2 = 0$

$x^2(7x^2 - 63) = 0$

$x^2 = 0 \rightarrow \boxed{x = 0}$

$7x^2 - 63 = 0$

$7x^2 = 63$

$x^2 = \frac{63}{7} = 9$

$\boxed{x = \pm\sqrt{9} = \pm 3}$

Como no es completa, puede resolverse factorizándola

b) $x^4 - 10x^2 + 9 = 0$

$x^2 = t$

$x^4 = t^2$

$\rightarrow \quad t^2 - 10t + 9 = 0$

$t = \frac{10 \pm \sqrt{100 - 36}}{2} = \frac{10 \pm \sqrt{64}}{2} = \frac{10 \pm 8}{2} \begin{cases} 9 \\ 1 \end{cases}$

$x = \pm\sqrt{t} \rightarrow \boxed{x = \pm\sqrt{9} = \pm 3}$

$\boxed{x = \pm\sqrt{1} = \pm 1}$

c) $4x^4 - 5x^2 + 1 = 0$

$x^2 = t$

$x^4 = t^2$

$\rightarrow \quad 4t^2 - 5t + 1 = 0$

$t = \frac{5 \pm \sqrt{25 - 16}}{8} = \frac{5 \pm 3}{8} \begin{cases} 1 \\ \frac{1}{4} \end{cases} \rightarrow \begin{array}{l} \boxed{x = \pm\sqrt{1} = \pm 1} \\ \boxed{x = \pm\sqrt{\frac{1}{4}} = \pm\frac{1}{2}} \end{array}$

d) $x^4 + 5x^2 + 4 = 0$

$x^2 = t$

$x^4 = t^2$

$\rightarrow \quad t^2 + 5t + 4 = 0$

$t = \frac{-5 \pm \sqrt{25 - 16}}{2} = \frac{-5 \pm 3}{2} \begin{cases} -1 \\ -4 \end{cases} \rightarrow \begin{array}{l} x = \pm\sqrt{-1} \not\in \mathbb{R} \\ x = \pm\sqrt{-4} \not\in \mathbb{R} \end{array}$

↓

No tiene solución en $\mathbb{R}$

p 89 : 13 |

a) $\frac{x+7}{x+3} + \frac{x^2-3x+6}{x^2+2x-3} = 1$

Tentando fatorizar x^2+2x-3:

$$\begin{array}{c|ccc} -3 & 1 & 2 & -3 \\ & & -3 & 3 \\ \hline & 1 & -1 & 0 \end{array} \rightarrow x^2+2x-3 = (x+3)(x-1)$$

$$\frac{x+7}{x+3} + \frac{x^2-3x+6}{(x+3)(x-1)} = 1$$

$$\frac{(x+7)(x-1)}{(x+3)(x-1)} + \frac{x^2-3x+6}{(x+3)(x-1)} = \frac{(x+3)(x-1)}{(x+3)(x-1)}$$

$$(x+7)(x-1) + x^2-3x+6 = (x+3)(x-1)$$

$$x^2 - x + 7x - 7 + x^2 - 3x + 6 = x^2 - x + 3x - 3$$

$$x^2 + x + 2 = 0$$

$$x = \frac{-1 \pm \sqrt{1-8}}{2} = \frac{-1 \pm \sqrt{-7}}{2} \quad \not\exists$$

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

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

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

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

$$-x^2 + 2x + 3 = 0$$

$\cdot(-1)$ → $x^2 - 2x - 3 = 0$

$$x = \frac{2 \pm \sqrt{4+12}}{2} = \frac{2 \pm 4}{2} \begin{cases} 3 \\ -1 \end{cases}$$

p 89: 14

a) $\sqrt{4x+5} = x+2$

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

$4x+5 = x^2+4x+4$

$x^2-1=0$

$x^2=1$

$\boxed{x=\pm 1}$

Comprobación:

- $x=1$
  - $\sqrt{4\cdot 1+5} = \sqrt{4+5} = \sqrt{9} = 3$
  - $1+2=3 \rightarrow$ Sí $\boxed{x=1}$
- $x=-1$
  - $\sqrt{4\cdot(-1)+5} = \sqrt{-4+5} = \sqrt{1} = 1$
  - $-1+2=1 \rightarrow$ Sí $\boxed{x=-1}$

b) $\sqrt{x}+2 = x$

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

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

$x^2-5x+4=0$

$x = \frac{5\pm\sqrt{25-16}}{2} = \frac{5\pm 3}{2} \begin{matrix} \nearrow 4 \\ \searrow 1 \end{matrix}$

Comprobación:

- $x=4$
  - $\sqrt{4}+2 = 2+2 = 4$ → Sí
  - 4 $\boxed{x=4}$
- ~~$x=1$~~
  - $\sqrt{1}+2 = 1+2 = 3$ → No
  - 1

c) $\left(\sqrt{x}-x+2\right)\left(\sqrt{x}-3\right)\left(\sqrt{x}+3\right)=0$

$\sqrt{x}-x+2=0$

$\sqrt{x} = x-2$ (Hecha en apdo. b) → $\boxed{x=4}$

$\sqrt{x}-3=0$

$\left(\sqrt{x}\right)^2=(3)^2$

$\boxed{x=9}$

(Comprobación: $\sqrt{9}-3=0 \rightarrow$ Sí)

$\sqrt{x}+3=0$

$\left(\sqrt{x}\right)^2=(-3)^2$

~~$\boxed{x=9}$~~

(Comprobación: $\sqrt{9}+3=3+3=6\neq 0 \rightarrow$ No)

No solución para $\sqrt{x}+3=0$

p89: 15

a) $(\sqrt{6-x})^2 = (3)^2$

$6 - x = 9$

$\boxed{x = -3}$

Comprobación:

- $\sqrt{6-(-3)} = \sqrt{9} = 3$
- 3

→ S

b) $\sqrt{2x-4} - 2\sqrt{x-3} = 0$

$(\sqrt{2x-4})^2 = (2\sqrt{x-3})^2$

$2x - 4 = 4(x-3)$

$2x - 4 = 4x - 12$

$-2x = -8$

$\boxed{x = 4}$

Comprobación:

- $\sqrt{2 \cdot 4 - 4} - 2\sqrt{4-3} =$
- $= \sqrt{4} - 2\sqrt{1} = 2 - 2 = 0$

↓

S

c) $(\sqrt{2x-1})^2 = (5)^2$

$2x - 1 = 25$

$2x = 26$

$\boxed{x = 13}$

Comprobación:

- $\sqrt{2 \cdot 13 - 1} = \sqrt{25} = 5$ → S

d) $2\sqrt{x-1} - \sqrt{6-x} = 0$

$(2\sqrt{x-1})^2 = (\sqrt{6-x})^2$

$4(x-1) = 6 - x$

$4x - 4 = 6 - x$

$5x = 10$

$\boxed{x = 2}$

Comprob:

- $2\sqrt{2-1} - \sqrt{6-2} =$
- $= 2 \cdot 1 - 2 = 0$ → S

p89:16

a) $\sqrt{x+4}+7=2x$

$(\sqrt{x+4})^2=(2x-7)^2$

$x+4=4x^2-28x+49$

$4x^2-29x+45=0$

$x=\frac{29\pm\sqrt{841-720}}{8}=\frac{29\pm11}{8}$ → 5, $\frac{18}{8}=\frac{9}{4}$

Comprob.

- $x=5$ · $\sqrt{5+4}+7=10$ · $2\cdot5=0$ → Sí
- $x=\frac{9}{4}$ · $\sqrt{\frac{9}{4}+4}+7=\sqrt{\frac{25}{4}}+7=\frac{5}{2}+7=\frac{19}{2}$ · $2\cdot\frac{9}{4}=\frac{9}{2}$ → NO

b) $\sqrt{13-x^2}+x=5$

$(\sqrt{13-x^2})^2=(5-x)^2$

$13-x^2=25-10x+x^2$

$2x^2-10x+12=0$

$x^2-5x+6=0$

$x=\frac{5\pm\sqrt{25-24}}{2}=\frac{5\pm1}{2}$ → 3, 2

Comprob.

- $x=3$ · $\sqrt{13-3^2}+3=2+3=5$ Sí
- $x=2$ · $\sqrt{13-2^2}+2=3+2=5$ Sí

c) $\sqrt{x-2}-\sqrt{12-x}=2$

$(\sqrt{x-2})^2=(2+\sqrt{12-x})^2$

$x-2=4+12-x+4\sqrt{12-x}$

$2x-18=4\sqrt{12-x}$

$(x-9)^2=(2\sqrt{12-x})^2$

$x^2+81-18x=4(12-x)$

$x^2+81-18x=48-4x$

$x^2-14x+33=0$

$x=\frac{14\pm\sqrt{196-132}}{2}=\frac{14\pm8}{2}$ → 11, 3

Comp

- $x=11$ · $\sqrt{11-2}-\sqrt{12-11}=3-1=2$ Sí
- $x=3$ · $\sqrt{3-2}-\sqrt{12-3}=1-3=-2$ NO

d) $\sqrt{x-5} + \sqrt{x} = 5$

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

$x - 5 = 25 + x - 10\sqrt{x}$

$-30 = 10\sqrt{x}$

$3 = \sqrt{x} \longrightarrow \boxed{x = 9}$

Comp

$\sqrt{9-5} + \sqrt{9} = 2+3 = 5$ ✓

p89 : 17

a) $\dfrac{x-1}{\sqrt{x^2+6x}} = \dfrac{1}{4}$

$\left[4(x-1)\right]^2 = \left[1 \cdot \sqrt{x^2+6x}\right]^2$

$16(x-1)^2 = x^2+6x$

$16(x^2-2x+1) = x^2+6x$

$16x^2 - 32x + 16 = x^2+6x$

$15x^2 - 38x + 16 = 0$

$x = \dfrac{38 \pm \sqrt{1444-960}}{30} = \dfrac{38 \pm 22}{30}$ ² $\begin{cases} \frac{14}{30} = \cancel{\frac{7}{15}} \\ \end{cases}$

Comp:

- $x = 2$

$\dfrac{2-1}{\sqrt{4+12}} = \dfrac{1}{4}$ ✓

- $x = \dfrac{7}{15}$

$\dfrac{\frac{7}{15}-1}{\sqrt{\frac{49}{225}+\frac{42}{15}}} = \dfrac{\frac{-8}{15}}{\sqrt{\frac{49+630}{225}}} = \dfrac{\frac{-8}{15}}{\frac{\sqrt{679}}{15}} \neq \dfrac{1}{4}$

↓

NO

b) $\frac{x-1}{\sqrt{x^2+6x}} = \frac{1}{2x}$

$[2x(x-1)]^2 = \left[\sqrt{x^2+6x}\right]^2$

$4x^2(x-1)^2 = x^2+6x$

$4x^2(x^2-2x+1) = x^2+6x$

$4x^4-8x^3+4x^2 = x^2+6x$

$4x^4-8x^3+3x^2-6x=0$

$x(4x^3-8x^2+3x-6)=0$

$x=0$

$4x^3-8x^2+3x-6=0$

	4	−8	3	−6
2		8	0	6
	4	0	3	0

$(x-2)(4x^2+3)=0$

$x-2=0$

$x=2$

$4x^2+3=0$

$4x^2=-3$

$x=\pm\sqrt{-\frac{3}{4}}$ ∄

Comp.

- $x=0$ $\quad \frac{0-1}{\sqrt{0+0}}$ ∄ → $x=0$ NO ES SOLUCIÓN
  - $\frac{1}{2\cdot 0}$ ∄

- $x=2$ $\quad \frac{2-1}{\sqrt{4+12}} = \frac{1}{4}$ ✓ S.
  - $\frac{1}{2\cdot 2} = \frac{1}{4}$

c)

$$\frac{1-x}{\sqrt{10+x}} = \frac{x+3}{3}$$

$$\left[3(1-x)\right]^2 = \left[\sqrt{10+x}\cdot(x+3)\right]^2$$

$$9(1-x)^2 = (10+x)(x+3)^2$$

$$9(1-2x+x^2) = (10+x)(x^2+6x+9)$$

$$9-18x+9x^2 = 10x^2+60x+90+x^3+6x^2+9x$$

$$x^3+7x^2+87x+81=0$$

	1	7	87	81
-1		-1	-6	-81
	1	6	81	0

$$(x+1)(x^2+6x+81)=0$$

$x+1=0 \rightarrow \boxed{x=-1}$

$x^2+6x+81=0$

$$x=\frac{-6\pm\sqrt{36-324}}{2}$$ ~~∄~~

Comp:

- $\frac{1-(-1)}{\sqrt{10-1}} = \frac{2}{\sqrt{9}} = \frac{2}{3}$
- $\frac{-1+3}{3} = \frac{2}{3}$

→ SI

d) $3\sqrt{x-1} + 2 = \frac{5}{\sqrt{x-1}}$

$3 \cdot \sqrt{x-1} \cdot \sqrt{x-1} + 2\sqrt{x-1} = 5$

$3(x-1) + 2\sqrt{x-1} = 5$

$2\sqrt{x-1} = 5 - 3x + 3$

$(2\sqrt{x-1})^2 = (-3x+8)^2$

$4(x-1) = 9x^2 - 48x + 64$

$4x - 4 = 9x^2 - 48x + 64$

$9x^2 - 52x + 68 = 0$

$x = \frac{52 \pm \sqrt{2704 - 2448}}{18} = \frac{52 \pm 16}{18}$ / $\frac{68}{18} = \frac{34}{9}$ \ 2

Comp

- $x = \frac{34}{9}$
  - $3 \cdot \sqrt{\frac{34}{9} - 1} + 2 = 3 \cdot \sqrt{\frac{25}{9}} + 2 = 3 \cdot \frac{5}{3} + 2 = 7$ → NO
  - $\frac{5}{\sqrt{\frac{34}{9} - 1}} = \frac{5}{\sqrt{\frac{25}{9}}} = \frac{5}{\frac{5}{3}} = 3$
- $x = 2$
  - $3 \cdot \sqrt{2-1} + 2 = 3 + 2 = 5$ → SI
  - $\frac{5}{\sqrt{2-1}} = 5$

EC EXPONENCIALES

p87: 8

a) $3^{x^2-5} = 81$

$3^{(x^2-5)} = 3^{(4)} \longrightarrow x^2 - 5 = 4$

$x^2 = 9$

$\boxed{x = \pm 3}$

b) $2^{x+1} = \sqrt[3]{4}$

$2^{x+1} = 2^{2/3} \longrightarrow x + 1 = \frac{2}{3}$

$4 = 2^2$

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

$\boxed{x = -\frac{1}{3}}$

c) $4^x + 4^{x+2} = 272$

$4 = 2^2$

$2^{2x} + 2^{2(x+2)} = 272$

$2^{2x} + 2^{2x+4} = 272$

$2^{2x} + 2^{2x} \cdot 2^4 = 272$

$2^{2x} + 16 \cdot 2^{2x} = 272$

$17 \cdot 2^{2x} = 272$

$2^{2x} = \frac{272}{17}$

$2^{2x} = 16$

$2^{(2x)} = 2^{(4)} \longrightarrow 2x = 4 \longrightarrow \boxed{x = 2}$

d) $2^x + 2^{x+3} = 36$

$2^x + 2^x \cdot 2^3 = 36$

$2^x + 8 \cdot 2^x = 36$

$9 \cdot 2^x = 36$

$2^x = \frac{36}{9} = 4$

$2^{(x)} = 2^{(2)} \rightarrow \boxed{x = 2}$

e) $5^x = 193$

193 no es potencia de 5, así que hay que tomar logaritmos. Si tenemos en la calculadora posibilidad de calcular logaritmos de cualquier base, lo mejor es hacer el log (base de la potencia), en este caso, $\log_5$, si no, logaritmos decimales:

$\log 5^{(x)} = \log 193$

$x \cdot \log 5 = \log 193 \rightarrow \boxed{x = \frac{\log 193}{\log 5}} = (3,27)$

f) $2^{x^2-2} = 835$

$\frac{2^{x^2}}{2^2} = 835$

$2^{x^2} = 4 \cdot 835 = 3340$

$\log 2^{x^2} = \log 3340$

$x^2 \cdot \log 2 = \log 3340$

$x^2 = \frac{\log 3340}{\log 2} \rightarrow \boxed{x = \pm \sqrt{\frac{\log 3340}{\log 2}}} = (\pm 3,42)$

(18) p93

a) $4^{x^2-2x-8} = \frac{1}{1024}$

$2^{2\cdot(x^2-2x-8)} = 2^{-10}$

$2(x^2-2x-8) = -10$

$x^2-2x-8 = -5$

$x^2-2x-3 = 0$

$x = \frac{2 \pm \sqrt{4+12}}{2} = \frac{2 \pm 4}{2}$ / $\boxed{3}$ $\boxed{-1}$

b) $3^{2x-1} = \sqrt{27}$

$3^{2x-1} = 3^{3/2}$

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

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

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

$\boxed{x = \frac{5}{4}}$

c) $2^{x+1} + 2^{x+3} = 320$

$2^x \cdot 2 + 2^x \cdot 2^3 = 320$

$2 \cdot 2^x + 8 \cdot 2^x = 320$

$10 \cdot 2^x = 320$

$2^x = 32$

$2^x = 2^5 \rightarrow \boxed{x = 5}$

d) $2{,}5^x = 49$

$\log 2{,}5^x = \log 49$

$x \cdot \log 2{,}5 = \log 49$

$\boxed{x = \frac{\log 49}{\log 2{,}5}}$

(19)

a) $5^{x^2-1} = 1$

$5^{x^2-1} = 5^0$

$x^2 - 1 = 0$

$\boxed{x = \pm 1}$

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

$3^{x+2} = 3^0$

$x + 2 = 0$

$\boxed{x = -2}$

c) $9^{2x+1} - 27^x = 0$

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

$2(2x+1) = 3x$

$4x + 2 = 3x$

$\boxed{x = -2}$

d) $5^{x-1} - 25^{x+1} = 0$

$5^{x-1} = 5^{2(x+1)}$

$x - 1 = 2(x+1)$

$x - 1 = 2x + 2$

$\boxed{x = -3}$

(21) a) $4^{x+1} = 2 - 7 \cdot 2^x$

$2^{2(x+1)} = 2 - 7 \cdot 2^x$

$2^{2x+2} = 2 - 7 \cdot 2^x$

$2^{2x} \cdot 2^2 = 2 - 7 \cdot 2^x$

$4 \cdot 2^{2x} + 7 \cdot 2^x - 2 = 0$

Cambio obtenido: $2^x = t$

$4t^2 + 7t - 2 = 0$

$t = \frac{-7 \pm \sqrt{49+32}}{8} = \frac{-7 \pm 9}{8}$ / $\frac{2}{8} = \frac{1}{4}$ → $2^x = \frac{1}{4}$

$2^x = 2^{-2}$

$\boxed{x = -2}$

\ -2

$2^x = -2$

∄

b) $3^{x+1} + 6 \cdot 3^x = 3$

$3^x \cdot 3 + 6 \cdot 3^x = 3$

$9 \cdot 3^x = 3$

$3^x = \frac{3}{9} = \frac{1}{3} = 3^{-1}$

$\boxed{x = -1}$

c) $2^{3+2x} - 3 \cdot 2^{x+1} + 1 = 0$

$2^3 \cdot 2^{2x} - 3 \cdot 2^x \cdot 2 + 1 = 0$

$8 \cdot 2^{2x} - 6 \cdot 2^x + 1 = 0$

Cambio usato: $2^x = t$

$8t^2 - 6t + 1 = 0$

$t = \frac{6 \pm \sqrt{36 - 32}}{16} = \frac{6 \pm 2}{16}$ $\begin{cases} \frac{8}{16} = \frac{1}{2} \\ \frac{4}{16} = \frac{1}{4} \end{cases}$

- $t = \frac{1}{2} \rightarrow 2^x = \frac{1}{2} = 2^{-1} \rightarrow \boxed{x = -1}$
- $t = \frac{1}{4} \rightarrow 2^x = \frac{1}{4} = \frac{1}{2^2} = 2^{-2} \rightarrow \boxed{x = -2}$

pico 6

a) $2^{x-1} = 64$

$2^{x-1} = 2^6$

$x - 1 = 6$

$\boxed{x = 7}$

b) $4^{x^2-1} = \frac{1}{16}$

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

$2^{2(x^2-1)} = 2^{-4}$

$2(x^2-1) = -4$

$x^2 - 1 = -2$

$x^2 = -1$

$x = \pm\sqrt{-1}$ ✗ ⇒ No tiene solución.

c) $3^{2x} = 54$

$\log 3^{2x} = \log 54$

$2x \cdot \log 3 = \log 54$

$\boxed{x = \frac{\log 54}{2 \cdot \log 3}}$

d) $3 \cdot 5^x + 5^{x+1} = 200$

$3 \cdot 5^x + 5^x \cdot 5 = 200$

$8 \cdot 5^x = 200$

$5^x = \frac{200}{8} = 25$

$5^x = 5^2$

$\boxed{x = 2}$

5C. LOGARÍTMICAS

p88: 9

a) $\log_2(2x-1) = 3$

$2^3 = 2x-1$

$8 = 2x-1$

$2x = 9$

$\boxed{x = \frac{9}{2}}$

b) $\log_2(x+3) = -1$

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

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

$1 = 2(x+3)$

$1 = 2x+6$

$2x = -5$

$\boxed{x = \frac{-5}{2}}$

c) $\log 4x = 2$

$10^2 = 4x$

$100 = 4x$

$\boxed{x = 25}$

d) $\log(x-2) = 2{,}5$

$\log(x-2) = \frac{5}{2}$

$10^{5/2} = x-2$

$\left(\sqrt{100.000}\right)^2 = (x-2)^2$

$100.000 = x^2 - 4x + 4$

$x^2 - 4x - 99.996 = 0$

$$\boxed{x = \frac{4 \pm \sqrt{16 + 399.984}}{2} = \frac{4 \pm \sqrt{400.000}}{2} = \frac{4 \pm 2\sqrt{100.000}}{2} = 2 \pm \sqrt{100.000}}$$

Como he elevado al cuadrado, hay que comprobar que se cumplen las soluciones

- $\boxed{x = 2 + \sqrt{100.000}}$ Solución

  $\log(2 + \sqrt{100.000} - 2) = 2{,}5$ Sí

- $x = 2 - \sqrt{100.000}$ No sol

  $\log(2 - \sqrt{100.000} - 2)$ ✗

  log de argumento negativo.

e) $\log(3x+1) = -1$

$10^{-1} = 3x+1$

$\frac{1}{10} = 3x+1$

$3x = -1 + \frac{1}{10}$

$3x = \frac{-9}{10}$

$\boxed{x = \frac{-3}{10}}$

f) $\log_2(x^2-8) = 0$

$2^0 = x^2-8$

$1 = x^2-8$

$x^2 = 9$

$\boxed{x = \pm 3}$

(22) p 89

a) $\log_7(5x+6) = 2$

$7^2 = 5x+6$

$49 = 5x+6$

$49-6 = 5x$

$43 = 5x$

$\boxed{x = \frac{43}{5}}$

b) $\log_3(2-3x) = 0$

$3^0 = 2-3x$

$1 = 2-3x$

$-1 = -3x$

$\boxed{x = \frac{1}{3}}$

c) $\log(\sqrt{x}-3) = -1$

$10^{-1} = \sqrt{x}-3$

$\frac{1}{10}+3 = \sqrt{x}$

$\frac{31}{10} = \sqrt{x}$

$\boxed{x = \frac{31^2}{10^2} = \frac{961}{100}}$

d) $\log_2(x^2-3x) = 2$

$2^2 = x^2-3x$

$x^2-3x-4=0$

$x = \frac{3 \pm \sqrt{9+16}}{2} = \frac{3 \pm 5}{2}$ → 4, $\boxed{-1}$

(23)

a) $\log_3 x + \log_3(x+2) = 1$

$\log_3[x\cdot(x+2)] = 1$

$3^1 = x(x+2)$

$x^2+2x-3=0$

$x = \frac{-2 \pm \sqrt{4+12}}{2} = \frac{-2 \pm 4}{2}$ → $\boxed{1}$, ~~-3~~ ← No puede ser solución porque $\log_3(-3)$ ∄

b) $\log_2(x-3) + \log_2(x-4) = 1$

$\log_2[(x-3)(x-4)] = 1$

$2^1 = (x-3)(x-4)$

$2 = x^2 - 4x - 3x + 12$

$x^2 - 7x + 10 = 0$

$x = \frac{7 \pm \sqrt{49-40}}{2} = \frac{7 \pm 3}{2}$ → 5, ~~2~~ ← No puede ser porque daría logaritmos negativos ¡no! ~~$\log_2(-1) + \log_2(-2)$~~

(25) $\log_5 x - \log_{25}(x+6) = 0$

$\log_5 x - \frac{\log_5(x+6)}{\log_5 25} = 0$

$\log_5 x - \frac{\log_5(x+6)}{2} = 0$

$2 \cdot \log_5 x = \log_5(x+6)$

$\log_5 x^2 = \log_5(x+6)$

$x^2 = x + 6$

$x^2 - x - 6 = 0$

$x = \frac{1 \pm \sqrt{1+24}}{2} = \frac{1 \pm 5}{2}$ → 3, ~~-2~~ ← ∄ $\log_5 -2$

(26)

a) $\log_5 x = 4 \log_x 5 + 3$

$\log_5 x = 4 \cdot \frac{\log_5 5}{\log_5 x} + 3$ ($\log_5 5 = 1$)

$\log_5 x = \frac{4}{\log_5 x} + 3$

Cambio de vble: $\log_5 x = t$

$t = \frac{4}{t} + 3$

$t^2 - 3t - 4 = 0$

$t = \frac{3 \pm \sqrt{9+16}}{2} = \frac{3 \pm 5}{2} \begin{matrix} \nearrow 4 \\ \searrow -1 \end{matrix}$

Deshago el cambio de vble:

- $\log_5 x = 4 \rightarrow 5^4 = x \rightarrow \boxed{x = 625}$
- $\log_5 x = -1 \rightarrow 5^{-1} = x \rightarrow \boxed{x = \frac{1}{5}}$

b) $\log_3 x = 9 \log_x 3$

$$\log_3 x = 9 \cdot \frac{\cancel{\log_3 3}^{1}}{\log_3 x}$$

$$\log_3 x = \frac{9}{\log_3 x}$$

$$(\log_3 x)^2 = 9$$

$$\log_3 x = \pm\sqrt{9} = \pm 3$$

$\downarrow$

- $\log_3 x = 3 \rightarrow \boxed{x = 3^3 = 27}$
- $\log_3 x = -3 \rightarrow \boxed{x = 3^{-3} = \frac{1}{27}}$

c) $\log_3 x + 2 = 3 \log_x 3$

$$\log_3 x + 2 = 3 \cdot \frac{\cancel{\log_3 3}^{1}}{\log_3 x}$$

Cambio de vble: $\log_3 x = t$

$$t + 2 = \frac{3}{t}$$

$$t^2 + 2t - 3 = 0$$

$$t = \frac{-2 \pm \sqrt{4+12}}{2} = \frac{-2 \pm 4}{2} \begin{matrix} \nearrow 1 \\ \searrow -3 \end{matrix}$$

Deshago cambio de vble:

- $\log_3 x = 1 \rightarrow \boxed{x = 3^1 = 3}$
- $\log_3 x = -3 \rightarrow \boxed{x = 3^{-3} = \frac{1}{27}}$

pl01 : 7

a) $\log_5(2x-3)=1$

$5^1 = 2x-3$

$2x = 5+3$

$\boxed{x=4}$

b) $\log_4\left(\frac{x+1}{2}\right)=-2$

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

$\frac{1}{4^2} = \frac{x+1}{2}$

$\frac{1}{16} = \frac{x+1}{2}$

$\frac{1}{8} = x+1$

$\boxed{x = \frac{1}{8}-1 = \frac{-7}{8}}$

c) $\log_2(\sqrt{x}-1)=3$

$2^3 = \sqrt{x}-1$

$8 = \sqrt{x}-1$

$8+1 = \sqrt{x}$

$9 = \sqrt{x}$

$\boxed{x=81}$

d) $\log(2^x-15)=0$

$10^0 = 2^x-15$

$1 = 2^x-15$

$2^x = 16$

$2^x = 2^4$

$\boxed{x=4}$

p101: 9 EC. POLINÓMICAS

a) $x^3 - 4x = 0$

$x(x^2 - 4) = 0$ → $x = 0$

$x^2 - 4 = 0$

$x^2 = 4$

$x = \pm 2$

b) $x^3 + x^2 - 6x = 0$

$x(x^2 + x - 6) = 0$ → $x = 0$

$x^2 + x - 6 = 0$

$x = \frac{-1 \pm \sqrt{1+24}}{2} = \frac{-1 \pm 5}{2}$ → 2, -3

c) $x^3 + 2x^2 - x - 2 = 0$

	1	2	−1	−2
1		1	3	2
	1	3	2	0
−1		−1	−2	
	1	2	0	

$(x-1)(x+1)(x+2) = 0$

$x - 1 = 0 \rightarrow x = 1$

$x + 1 = 0 \rightarrow x = -1$

$x + 2 = 0 \rightarrow x = -2$

d) $x^3 - x^2 - 5x - 3 = 0$

	1	−1	−5	−3
−1		−1	2	3
	1	−2	−3	0

	1	−2	−3
−1		−1	3
	1	−3	0

$(x+1)^2 \cdot (x-3) = 0$

$(x+1)^2 = 0$

$x+1=0$

$x=-1$

$x-3=0$

$x=3$