

35.

$$\begin{array}{r|rrrr}
 & 1 & -1 & 9 & -9 \\
 1 & & 1 & 0 & 9 \\
 \hline
 & 1 & 0 & 9 & 0 \\
 \hline
 & 1 & 0 & 9 & 0 \\
 \hline
 \end{array}$$

Arrels: 1

Desc.:  $(x-1)(x^2+9)$ 

$$x^2+9=0 \rightarrow x^2=-9 \rightarrow x=\sqrt{-9} \text{ no té solució}$$

$$\begin{array}{r|rrrrr}
 & 1 & 0 & 1 & 0 & -20 \\
 2 & & 2 & 4 & 10 & 20 \\
 \hline
 & 1 & 2 & 5 & 10 & 0 \\
 \hline
 -2 & & -2 & 0 & -10 & \\
 \hline
 & 1 & 0 & 5 & & \\
 \hline
 \end{array}$$

Arrels: 2, -2

Desc.:  $(x-2)(x+2)(x^2+5)$ 

$$x^2+5=0 \rightarrow x^2=-5 \rightarrow x=\sqrt{-5} \text{ no té solució}$$

$$\begin{array}{r|rrrr}
 & 1 & 1 & -5 & -5 \\
 -1 & & -1 & 0 & 5 \\
 \hline
 & 1 & 0 & -5 & 0 \\
 \hline
 \end{array}$$

Arrels: -1,  $\sqrt{5}$ ,  $-\sqrt{5}$ Desc.:  $(x+1)(x-\sqrt{5})(x+\sqrt{5})$ 

$$x^2-5=0 \rightarrow x^2=5 \rightarrow x=\pm\sqrt{5}$$

$$\begin{array}{r|rrrrr}
 & 1 & 0 & 0 & 0 & -81 \\
 3 & & 3 & 9 & 27 & 81 \\
 \hline
 & 1 & 3 & 9 & 27 & 0 \\
 \hline
 -3 & & -3 & 0 & -27 & \\
 \hline
 & 1 & 0 & 9 & & \\
 \hline
 \end{array}$$

Arrels: 3, -3

Desc.:  $(x-3)(x+3)(x^2+9)$ 

$$x^2+9=0 \rightarrow x^2=-9 \rightarrow x=\sqrt{-9} \rightarrow \text{no té solució}$$

36.

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

$$b) 4x^4 - 16x^2 = 4x^2(x^2 - 4) = 4x^2(x+2)(x-2)$$

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

$$d) 3x^2 + 30x + 75 = 3(x^2 + 10x + 25) = 3(x+5)^2$$

$$e) 5x^3 - 45x = 5x(x^2 - 9) = 5x(x+3)(x-3)$$

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

38.

a)  $x^3 - 7x - 6 = 0$

$$\begin{array}{r|rrrr} & 1 & 0 & -7 & -6 \\ -1 & & -1 & 1 & 6 \\ \hline & 1 & -1 & -6 & 0 \end{array}$$

Fact:  $(x+1)(x-3)(x+2)$

Sol:  $-1, 3, -2$

$$x_{1,2} = \frac{1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot (-6)}}{2 \cdot 1} = \frac{1 \pm \sqrt{25}}{2} = \begin{cases} \frac{1+5}{2} = 3 \\ \frac{1-5}{2} = -2 \end{cases}$$

b)  $2x^3 - 3x^2 - 9x + 10 = 0$

$$\begin{array}{r|rrrr} & 2 & -3 & -9 & +10 \\ 1 & & 2 & -1 & -10 \\ \hline & 2 & -1 & -10 & 0 \end{array}$$

Fact:  $2(x-1)(x-\frac{5}{2})(x+2)$

Sol:  $1, \frac{5}{2}, -2$

$$x_{1,2} = \frac{1 \pm \sqrt{1^2 - 4 \cdot 2 \cdot (-10)}}{2 \cdot 2} = \frac{1 \pm \sqrt{81}}{4} = \begin{cases} \frac{1+9}{4} = \frac{10}{4} = \frac{5}{2} \\ \frac{1-9}{4} = -2 \end{cases}$$

c)  $x^4 - 5x^3 + 5x^2 - 6 = 0$

$$\begin{array}{r|rrrrr} & 1 & -5 & 5 & 5 & -6 \\ 1 & & 1 & -4 & 1 & 6 \\ \hline & 1 & -4 & 1 & 6 & 0 \\ -1 & & -1 & 5 & -6 & \\ \hline & 1 & -5 & 6 & 0 & \end{array}$$

Fact:  $(x-1)(x+1)(x-3)(x-2)$

Sol:  $1, -1, 3, 2$

$$x_{1,2} = \frac{5 \pm \sqrt{25 - 4 \cdot 1 \cdot 6}}{2 \cdot 1} = \frac{5 \pm \sqrt{1}}{2} = \begin{cases} \frac{6}{2} = 3 \\ \frac{4}{2} = 2 \end{cases}$$

d)  $3x^3 - 10x^2 + 9x - 2 = 0$

$$\begin{array}{r|rrrr} & 3 & -10 & 9 & -2 \\ 1 & & 3 & -7 & 2 \\ \hline & 3 & -7 & 2 & 0 \end{array}$$

Fact:  $3(x-1)(x-2)(x-\frac{1}{3})$

Sol:  $1, 2, \frac{1}{3}$

$$x_{1,2} = \frac{7 \pm \sqrt{49 - 4 \cdot 3 \cdot 2}}{2 \cdot 3} = \frac{7 \pm \sqrt{49 - 24}}{6} = \frac{7 \pm 5}{6} = \begin{cases} \frac{12}{6} = 2 \\ \frac{2}{6} = \frac{1}{3} \end{cases}$$

42.

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

$$x^2 = y$$

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

$$y = \frac{5 \pm \sqrt{25 - 4 \cdot 4}}{2} = \frac{5 \pm \sqrt{9}}{2} \begin{cases} \frac{5+3}{2} = 4 \\ \frac{5-3}{2} = 1 \end{cases}$$

$$y = 4 \rightarrow x^2 = 4 \rightarrow x = \sqrt{4} = \pm 2$$

$$y = 1 \rightarrow x^2 = 1 \rightarrow x = \sqrt{1} = \pm 1$$

$$\text{Sol: } x = 2, x = -2, x = 1, x = -1$$

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

$$x^2 = y$$

$$y^2 + 3y - 4 = 0$$

$$y = \frac{-3 \pm \sqrt{9 - 4 \cdot (-4)}}{2 \cdot 1} = \frac{-3 \pm \sqrt{25}}{2} \begin{cases} \frac{2}{2} = 1 \\ \frac{-8}{2} = -4 \end{cases}$$

$$y = 1 \rightarrow x^2 = 1 \rightarrow x = \sqrt{1} = \pm 1$$

$$y = -4 \rightarrow x^2 = -4 \rightarrow x = \sqrt{-4} \text{ no real solutions}$$

$$\text{Sol: } x = 1, x = -1$$

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

$$x^2 = y$$

$$y^2 + 3y + 2 = 0$$

$$y = \frac{-3 \pm \sqrt{9 - 4 \cdot 2}}{2 \cdot 1} = \frac{-3 \pm \sqrt{1}}{2} \begin{cases} \frac{-2}{2} = -1 \\ \frac{-4}{2} = -2 \end{cases}$$

$$y = -1 \rightarrow x^2 = -1 \rightarrow x = \sqrt{-1}$$

$$y = -2 \rightarrow x^2 = -2 \rightarrow x = \sqrt{-2}$$

} → no real solutions

$$d) x^4 - 9x^2 + 8 = 0$$

$$y = x^2$$

$$y^2 - 9y + 8 = 0$$

$$y = \frac{9 \pm \sqrt{81 - 4 \cdot 8}}{2 \cdot 1} = \frac{9 \pm \sqrt{49}}{2} = \begin{cases} \frac{16}{2} = 8 \\ \frac{2}{2} = 1 \end{cases}$$

$$y = 8 \rightarrow x^2 = 8 \rightarrow x = \pm 2\sqrt{2}$$

$$y = 1 \rightarrow x^2 = 1 \rightarrow x = \pm 1$$

$$\text{Sol: } x = 2\sqrt{2}, x = -2\sqrt{2}, x = 1, x = -1$$