

# Escola Secundária de Tavira

Ano lectivo 2003/2004

10º ano

Resolução das equações de 2º grau da ficha de exercícios

Abril 2004

$$u) 5x^2 = 0 \Leftrightarrow x^2 = \frac{0}{5} \Leftrightarrow x^2 = 0 \Leftrightarrow x = 0$$

$$C.S. = \{0\}$$

$$v) (2x-5)(x+3) = 0 \Leftrightarrow 2x-5=0 \vee x+3=0 \Leftrightarrow 2x=5 \vee x=-3 \Leftrightarrow x = \frac{5}{2} \vee x = -3$$

$$C.S. = \left\{ -3, \frac{5}{2} \right\}$$

$$w) 6x^2 - 18x = 0 \Leftrightarrow x(6x-18) = 0 \Leftrightarrow x=0 \vee 6x-18=0 \Leftrightarrow x=0 \vee 6x=18 \Leftrightarrow \\ \Leftrightarrow x=0 \vee x = \frac{18}{6} \Leftrightarrow x=0 \vee x=3$$

$$C.S. = \{0, 3\}$$

$$x) -2x^2 - 10 = 0 \Leftrightarrow -2x^2 = 10 \Leftrightarrow x^2 = \frac{10}{-2} \Leftrightarrow x^2 = -5 \text{ condição impossível}$$

$$C.S. = \{ \}$$

$$y) (2x-3)(2x+3) = (x-1)^2 - 12 \Leftrightarrow (2x)^2 - 3^2 = x^2 - 2 \cdot x \cdot 1 + 1^2 - 12 \Leftrightarrow \\ \Leftrightarrow 4x^2 - 9 = x^2 - 2x + 1 - 12 \Leftrightarrow 4x^2 - x^2 + 2x - 9 - 1 + 12 = 0 \Leftrightarrow 3x^2 + 2x + 2 = 0 \Leftrightarrow \\ \Leftrightarrow x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 3 \cdot 2}}{2 \cdot 3} \Leftrightarrow x = \frac{-2 \pm \sqrt{4 - 24}}{6} \Leftrightarrow x = \frac{-2 \pm \sqrt{-20}}{6} \text{ condição impossível}$$

$$C.S. = \{ \}$$

$$z) 7(2-x^2) + x = x + 14 \Leftrightarrow 14 - 7x^2 + x = x + 14 \Leftrightarrow -7x^2 + x - x + 14 - 14 = 0 \Leftrightarrow \\ \Leftrightarrow -7x^2 = 0 \Leftrightarrow x^2 = \frac{0}{-7} \Leftrightarrow x^2 = 0 \Leftrightarrow x = 0$$

$$C.S. = \{0\}$$

$$aa) 3x^2 - 6x + 3 = 0 \Leftrightarrow x^2 - 2x + 1 = 0 \Leftrightarrow x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \cdot 1 \cdot 1}}{2 \cdot 1} \Leftrightarrow \\ \Leftrightarrow x = \frac{2 \pm \sqrt{4-4}}{2} \Leftrightarrow x = \frac{2 \pm \sqrt{0}}{2} \Leftrightarrow x = \frac{2 \pm 0}{2} \Leftrightarrow x = \frac{2}{2} \Leftrightarrow x = 1$$

$$C.S. = \{1\}$$

$$\text{bb) } \frac{2x^2}{3} = 6 \Leftrightarrow 2x^2 = 6 \cdot 3 \Leftrightarrow x^2 = \frac{18}{2} \Leftrightarrow x^2 = 9 \Leftrightarrow x = \pm\sqrt{9} \Leftrightarrow x = \pm 3$$

$$C.S. = \{-3, 3\}$$

$$\begin{aligned} \text{cc) } 5 - 3(x - x^2) &= 5 - 2x \Leftrightarrow 5 - 3x + 3x^2 = 5 - 2x \Leftrightarrow 3x^2 - 3x + 2x + 5 - 5 = 0 \Leftrightarrow \\ &\Leftrightarrow 3x^2 - x = 0 \Leftrightarrow x(3x - 1) = 0 \Leftrightarrow x = 0 \vee 3x - 1 = 0 \Leftrightarrow x = 0 \vee 3x = 1 \Leftrightarrow \\ &\Leftrightarrow x = 0 \vee x = \frac{1}{3} \end{aligned}$$

$$C.S. = \left\{0, \frac{1}{3}\right\}$$

$$\begin{aligned} \text{dd) } (x+1)^2 - x^2 &= (x+3)(x-3) - x \Leftrightarrow x^2 + 2 \cdot x \cdot 1 + 1^2 - x^2 = x^2 - 3^2 - x \Leftrightarrow \\ &\Leftrightarrow x^2 + 2x + 1 - x^2 = x^2 - 9 - x \Leftrightarrow x^2 - x^2 - x^2 + 2x + x + 1 + 9 = 0 \Leftrightarrow \\ &\Leftrightarrow -x^2 + 3x + 10 = 0 \Leftrightarrow x = \frac{-3 \pm \sqrt{3^2 - 4 \cdot (-1) \cdot 10}}{2 \cdot (-1)} \Leftrightarrow x = \frac{-3 \pm \sqrt{9 + 40}}{-2} \Leftrightarrow \\ &\Leftrightarrow x = \frac{-3 \pm \sqrt{49}}{-2} \Leftrightarrow x = \frac{-3 \pm 7}{-2} \Leftrightarrow x = \frac{-3 - 7}{-2} \vee x = \frac{-3 + 7}{-2} \Leftrightarrow \\ &\Leftrightarrow x = \frac{-10}{-2} \vee x = \frac{4}{-2} \Leftrightarrow x = 5 \vee x = -2 \end{aligned}$$

$$C.S. = \{-2, 5\}$$

$$\begin{aligned} \text{ee) } \left(\frac{3}{2} - x\right)^2 &= 1 + \frac{x^2}{8} \Leftrightarrow \left(\frac{3}{2}\right)^2 - 2 \cdot \frac{3}{2} \cdot x + x^2 = 1 + \frac{x^2}{8} \Leftrightarrow \frac{9}{4} - 3x + x^2 = 1 + \frac{x^2}{8} \Leftrightarrow \\ &\Leftrightarrow \frac{9}{4} - \frac{3x}{1} + \frac{x^2}{1} = \frac{1}{1} + \frac{x^2}{8} \Leftrightarrow 18 - 24x + 8x^2 = 8 + x^2 \Leftrightarrow 8x^2 - x^2 - 24x + 18 - 8 = 0 \Leftrightarrow \end{aligned}$$

$$\Leftrightarrow 7x^2 - 24x + 10 = 0 \Leftrightarrow x = \frac{-(-24) \pm \sqrt{(-24)^2 - 4 \cdot 7 \cdot 10}}{2 \cdot 7} \Leftrightarrow$$

$$\Leftrightarrow x = \frac{24 \pm \sqrt{576 - 280}}{14} \Leftrightarrow x = \frac{24 \pm \sqrt{296}}{14} \Leftrightarrow x = \frac{24 \pm 2\sqrt{74}}{14} \Leftrightarrow x = \frac{12 \pm \sqrt{74}}{7} \Leftrightarrow$$

$$\Leftrightarrow x = \frac{12 - \sqrt{74}}{7} \vee x = \frac{12 + \sqrt{74}}{7}$$

$$\begin{array}{l|l} 296 & 2 \\ 148 & 2 \\ 74 & 2 \\ 37 & 37 \\ 1 & \end{array}$$

$$C.S. = \left\{ \frac{12 - \sqrt{74}}{7}, \frac{12 + \sqrt{74}}{7} \right\}$$

$$\text{ff) } 3x^2 = 0 \Leftrightarrow x^2 = \frac{0}{3} \Leftrightarrow x^2 = 0 \Leftrightarrow x = 0$$

$$C.S. = \{0\}$$

$$\begin{aligned} \text{gg)} \quad -3x^2 + 6x - 3 = 0 &\Leftrightarrow -x^2 + 2x - 1 = 0 \Leftrightarrow x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot (-1) \cdot (-1)}}{2 \cdot (-1)} \Leftrightarrow \\ &\Leftrightarrow x = \frac{-2 \pm \sqrt{4 - 4}}{2} \Leftrightarrow x = \frac{-2 \pm \sqrt{0}}{2} \Leftrightarrow x = \frac{-2 \pm 0}{2} \Leftrightarrow x = \frac{-2}{2} \Leftrightarrow x = -1 \\ &C.S. = \{-1\} \end{aligned}$$

$$\begin{aligned} \text{hh)} \quad \frac{2x^2}{5} = 10 &\Leftrightarrow 2x^2 = 10 \cdot 5 \Leftrightarrow x^2 = \frac{50}{2} \Leftrightarrow x^2 = 25 \Leftrightarrow x = \pm\sqrt{25} \Leftrightarrow x = \pm 5 \\ &C.S. = \{-5, 5\} \end{aligned}$$

$$\begin{aligned} \text{ii)} \quad -3x^2 - 15 = 0 &\Leftrightarrow -3x^2 = 15 \Leftrightarrow x^2 = \frac{15}{-3} \Leftrightarrow x^2 = -5 \text{ condição impossível} \\ &C.S. = \{ \} \end{aligned}$$

$$\begin{aligned} \text{jj)} \quad (x+1)^2 + x &= (x-4)(x+4) + x^2 + 7 \Leftrightarrow x^2 + 2 \cdot x \cdot 1 + 1^2 + x = x^2 - 4^2 + x^2 + 7 \Leftrightarrow \\ &\Leftrightarrow x^2 + 2x + 1 + x = x^2 - 16 + x^2 + 7 \Leftrightarrow x^2 - x^2 - x^2 + 2x + x + 1 + 16 - 7 = 0 \Leftrightarrow \\ &\Leftrightarrow -x^2 + 3x + 10 = 0 \Leftrightarrow x = \frac{-3 \pm \sqrt{3^2 - 4 \cdot (-1) \cdot 10}}{2 \cdot (-1)} \Leftrightarrow x = \frac{-3 \pm \sqrt{9 + 40}}{-2} \Leftrightarrow \\ &\Leftrightarrow x = \frac{-3 \pm \sqrt{49}}{-2} \Leftrightarrow x = \frac{-3 \pm 7}{-2} \Leftrightarrow x = \frac{-3 - 7}{-2} \vee x = \frac{-3 + 7}{-2} \Leftrightarrow \\ &\Leftrightarrow x = \frac{-10}{-2} \vee x = \frac{4}{-2} \Leftrightarrow x = 5 \vee x = -2 \\ &C.S. = \{-2, 5\} \end{aligned}$$

$$\begin{aligned} \text{kk)} \quad 5(2-x^2) + 2x &= 10 + 2x \Leftrightarrow 10 - 5x^2 + 2x = 10 + 2x \Leftrightarrow \\ &\Leftrightarrow -5x^2 + 2x - 2x + 10 - 10 = 0 \Leftrightarrow -5x^2 = 0 \Leftrightarrow x^2 = \frac{0}{-5} \Leftrightarrow x^2 = 0 \Leftrightarrow x = 0 \\ &C.S. = \{0\} \end{aligned}$$

$$\begin{aligned} \text{ll)} \quad (x-4)(2x+3) &= 0 \Leftrightarrow x-4=0 \vee 2x+3=0 \Leftrightarrow x=4 \vee 2x=-3 \Leftrightarrow \\ &\Leftrightarrow x=4 \vee x = \frac{-3}{2} \Leftrightarrow x=4 \vee x = -\frac{3}{2} \\ &C.S. = \left\{ -\frac{3}{2}, 4 \right\} \end{aligned}$$

$$\begin{aligned} \text{mm)} \quad 3x^2 - 9x = 0 &\Leftrightarrow x(3x-9) = 0 \Leftrightarrow x=0 \vee 3x-9=0 \Leftrightarrow x=0 \vee 3x=9 \Leftrightarrow \\ &\Leftrightarrow x=0 \vee x = \frac{9}{3} \Leftrightarrow x=0 \vee x=3 \\ &C.S. = \{0, 3\} \end{aligned}$$

$$\begin{aligned}
\text{nn)} \quad & \left(\frac{5}{2} - x\right)^2 + 2x = 5 + \frac{x^2}{8} \Leftrightarrow \left(\frac{5}{2}\right)^2 - 2 \cdot \frac{5}{2} \cdot x + x^2 + 2x = 5 + \frac{x^2}{8} \Leftrightarrow \\
& \Leftrightarrow \frac{25}{4} - 5x + x^2 + 2x = 5 + \frac{x^2}{8} \Leftrightarrow \frac{25}{4} - \frac{5x}{1} + \frac{x^2}{1} + \frac{2x}{1} = \frac{5}{1} + \frac{x^2}{8} \Leftrightarrow \\
& \Leftrightarrow 50 - 40x + 8x^2 + 16x = 40 + x^2 \Leftrightarrow 8x^2 - x^2 - 40x + 16x + 50 - 40 = 0 \Leftrightarrow \\
& \Leftrightarrow 7x^2 - 24x + 10 = 0 \Leftrightarrow x = \frac{-(-24) \pm \sqrt{(-24)^2 - 4 \cdot 7 \cdot 10}}{2 \cdot 7} \Leftrightarrow \\
& \Leftrightarrow x = \frac{24 \pm \sqrt{576 - 280}}{14} \Leftrightarrow x = \frac{24 \pm \sqrt{296}}{14} \Leftrightarrow x = \frac{24 \pm 2\sqrt{74}}{14} \Leftrightarrow \\
& \Leftrightarrow x = \frac{12 \pm \sqrt{74}}{7} \Leftrightarrow x = \frac{12 - \sqrt{74}}{7} \vee x = \frac{12 + \sqrt{74}}{7}
\end{aligned}$$

296	2
148	2
74	2
37	37
1	

$$C.S. = \left\{ \frac{12 - \sqrt{74}}{7}, \frac{12 + \sqrt{74}}{7} \right\}$$

$$\begin{aligned}
\text{oo)} \quad & (2x + 5)(2x - 5) = (x - 1)^2 - 28 \Leftrightarrow (2x)^2 - 5^2 = x^2 - 2 \cdot x \cdot 1 + 1^2 - 28 \Leftrightarrow \\
& \Leftrightarrow 4x^2 - 25 = x^2 - 2x + 1 - 28 \Leftrightarrow 3x^2 + 2x + 2 = 0 \Leftrightarrow x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 3 \cdot 2}}{2 \cdot 3} \Leftrightarrow \\
& \Leftrightarrow x = \frac{-2 \pm \sqrt{4 - 24}}{6} \Leftrightarrow x = \frac{-2 \pm \sqrt{-20}}{6} \text{ condição impossível}
\end{aligned}$$

$$C.S. = \{ \}$$

$$\begin{aligned}
\text{pp)} \quad & 7 - 5(x - x^2) = 7 - 4x \Leftrightarrow 7 - 5x + 5x^2 = 7 - 4x \Leftrightarrow 5x^2 - 5x + 4x + 7 - 7 = 0 \Leftrightarrow \\
& \Leftrightarrow 5x^2 - x = 0 \Leftrightarrow x(5x - 1) = 0 \Leftrightarrow x = 0 \vee 5x - 1 = 0 \Leftrightarrow x = 0 \vee 5x = 1 \Leftrightarrow \\
& \Leftrightarrow x = 0 \vee x = \frac{1}{5}
\end{aligned}$$

$$C.S. = \left\{ 0, \frac{1}{5} \right\}$$

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