

CHAPTER 1 TRUE/FALSE EXERCISES, Page 130

1. False, $(-3)^2 = 9$, therefore $x = -3$ is also a solution. 3. True
5. False, $100 > 1$ but $\frac{1}{100} \neq \frac{1}{1}$.
7. False, if $a = 1$, $b = 1$, and $c = 2$, then $\sqrt{a} + \sqrt{b} = \sqrt{1} + \sqrt{1} = 1 + 1 = 2 = c$ but $a + b = 1 + 1 = 2 \neq c^2$.
9. False, $3x^2 - 48 = 0$ also has roots of 4 and -4.

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1. $x - 2(5x - 3) = -3(-x + 4)$
 $x - 10x + 6 = 3x - 12$
 $-9x + 6 = 3x - 12$
 $-12x = -18$
 $x = \frac{3}{2}$
3. $\frac{4x}{3} - \frac{4x-1}{6} = \frac{1}{2}$
 $6\left(\frac{4x}{3} - \frac{4x-1}{6}\right) = 6\left(\frac{1}{2}\right)$
 $2(4x) - (4x-1) = 3$
 $8x - 4x + 1 = 3$
 $4x + 1 = 3$
 $4x = 2$
 $x = \frac{1}{2}$
5. $\frac{x}{x+2} + \frac{1}{4} = 5$
 $4(x+2)\left(\frac{x}{x+2} + \frac{1}{4}\right) = 5(4)(x+2)$
 $4x + x + 2 = 20(x+2)$
 $5x + 2 = 20x + 40$
 $-15x = 38$
 $x = -\frac{38}{15}$
7. $x^2 - 5x + 6 = 0$
 $(x-2)(x-3) = 0$
 $x-2 = 0$ or $x-3 = 0$
 $x = 2$ $x = 3$
9. $3x^2 - x - 1 = 0$
 $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(3)(-1)}}{2(3)}$
 $x = \frac{1 \pm \sqrt{13}}{6}$
 $x = \frac{1 + \sqrt{13}}{6}$ or $x = \frac{1 - \sqrt{13}}{6}$
11. $3x^3 - 5x^2 = 0$
 $x^2(3x - 5) = 0$
 $x^2 = 0 \Rightarrow x = 0$
 $3x - 5 = 0 \Rightarrow x = \frac{5}{3}$
 $x = 0$ or $x = \frac{5}{3}$
13. $6x^4 - 23x^2 + 20 = 0$
Let $u = x^2$.
 $6u^2 - 23u + 20 = 0$
 $(3u-4)(2u-5) = 0$
 $u = \frac{4}{3}$ or $u = \frac{5}{2}$
 $x^2 = \frac{4}{3}$ $x^2 = \frac{5}{2}$
 $x = \pm\sqrt{\frac{4}{3}}$ $x = \pm\sqrt{\frac{5}{2}}$
 $x = \pm\frac{2}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$ $x = \pm\frac{\sqrt{5}}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)$
 $x = \pm\frac{2\sqrt{3}}{3}$ $x = \pm\frac{\sqrt{10}}{2}$
15. $\sqrt{x^2 - 15} = \sqrt{-2x}$
 $\left[\sqrt{x^2 - 15}\right]^2 = \left[\sqrt{-2x}\right]^2$
 $x^2 - 15 = -2x$
 $x^2 + 2x - 15 = 0$
 $(x+5)(x-3) = 0$
 $x = -5$ or $x = 3$
Check $\sqrt{(-5)^2 - 15} = \sqrt{-2(-5)}$
 $\sqrt{10} = \sqrt{10}$
 $\sqrt{3^2 - 15} = \sqrt{-2(3)}$
 $\sqrt{-6} = \sqrt{-6}$
The solutions are -5 and 3.

$$\begin{aligned}
 17. \quad & \sqrt{3x+4} + \sqrt{x-3} = 5 \\
 & \sqrt{3x+4} = 5 - \sqrt{x-3} \\
 & [\sqrt{3x+4}]^2 = [5 - \sqrt{x-3}]^2 \\
 & 3x+4 = 25 - 10\sqrt{x-3} + x-3 \\
 & 2x-18 = -10\sqrt{x-3} \\
 & x-9 = -5\sqrt{x-3} \\
 & (x-9)^2 = [-5\sqrt{x-3}]^2 \\
 & x^2 - 18x + 81 = 25(x-3) \\
 & x^2 - 18x + 81 = 25x - 75 \\
 & x^2 - 43x + 156 = 0 \\
 & (x-4)(x-39) = 0 \\
 & x = 4 \quad \text{or} \quad x = 39
 \end{aligned}$$

$$\begin{aligned}
 \text{Check} \quad & \sqrt{3(4)+4} + \sqrt{4-3} = 5 \\
 & \sqrt{16} + \sqrt{1} = 5 \\
 & 4 + 1 = 5 \\
 & 5 = 5 \\
 & \sqrt{3(39)+4} + \sqrt{39-3} = 5 \\
 & \sqrt{121} + \sqrt{36} = 5 \\
 & 11 + 6 = 5 \\
 & 17 = 5 \quad (\text{No})
 \end{aligned}$$

The solution is 4.

$$\begin{aligned}
 21. \quad & \frac{1}{(y+3)^2} = 1 \\
 & 1 = (y+3)^2 \\
 & 1 = y^2 + 6y + 9 \\
 & 0 = y^2 + 6y + 8 \\
 & 0 = (y+2)(y+4) \\
 & y = -2 \quad \text{or} \quad y = -4
 \end{aligned}$$

$$\begin{aligned}
 27. \quad & (x+2)^{1/2} + x(x+2)^{3/2} = 0 \\
 & (x+2)^{1/2}[1 + x(x+2)] = 0 \\
 & (x+2)^{1/2}[1 + x^2 + 2x] = 0 \\
 & (x+2)^{1/2}(x^2 + 2x + 1) = 0 \\
 & (x+2)^{1/2}(x+1)^2 = 0 \\
 & (x+2)^{1/2} = 0 \quad \text{or} \quad (x+1)^2 = 0 \\
 & x+2 = 0 \quad x+1 = 0 \\
 & x = -2 \quad x = -1
 \end{aligned}$$

$$\begin{aligned}
 19. \quad & \sqrt{4-3x} - \sqrt{5-x} = \sqrt{5+x} \\
 & [\sqrt{4-3x} - \sqrt{5-x}]^2 = [\sqrt{5+x}]^2 \\
 & -2\sqrt{(4-3x)(5-x)} = 5x-4 \\
 & [-2\sqrt{(4-3x)(5-x)}]^2 = [5x-4]^2 \\
 & 4(4-3x)(5-x) = 25x^2 - 40x + 16 \\
 & 4(20-19x+3x^2) = 25x^2 - 40x + 16 \\
 & 0 = 13x^2 + 36x - 64 \\
 & 0 = (13x-16)(x+4) \\
 & x = \frac{16}{13} \quad \text{or} \quad x = -4
 \end{aligned}$$

$$\begin{aligned}
 \text{Check} \quad & \sqrt{4-3\left(\frac{16}{13}\right)} - \sqrt{5-\frac{16}{13}} = \sqrt{5+\frac{16}{13}} \\
 & \sqrt{\frac{52}{13} - \left(\frac{48}{13}\right)} - \sqrt{\frac{65}{13} - \frac{16}{13}} = \sqrt{\frac{65}{13} + \frac{16}{13}} \\
 & \sqrt{\frac{4}{13}} - \sqrt{\frac{49}{13}} = \sqrt{\frac{81}{13}} \\
 & \frac{2}{\sqrt{13}} - \frac{7}{\sqrt{13}} = \frac{9}{\sqrt{13}} \quad (\text{No})
 \end{aligned}$$

$$\begin{aligned}
 & \sqrt{4-3(-4)} - \sqrt{5-(-4)} = \sqrt{5-4} \\
 & \sqrt{16} - \sqrt{9} = \sqrt{1} \\
 & 4 - 3 = 1 \\
 & 1 = 1
 \end{aligned}$$

The solution is -4.

$$\begin{aligned}
 23. \quad & |x-3| = 2 \\
 & x-3 = 2 \quad \text{or} \quad x-3 = -2 \\
 & x = 5 \quad x = 1
 \end{aligned}$$

$$\begin{aligned}
 25. \quad & |2x+1| = 5 \\
 & 2x+1 = 5 \quad \text{or} \quad 2x+1 = -5 \\
 & 2x = 4 \quad 2x = -6 \\
 & x = 2 \quad x = -3
 \end{aligned}$$

$$\begin{aligned}
 29. \quad & (2x-1)^{2/3} + (2x-1)^{1/3} = 12 \\
 & \text{Let } u = (2x-1)^{1/3}. \\
 & u^2 + u = 12 \\
 & u^2 + u - 12 = 0 \\
 & (u+4)(u-3) = 0 \\
 & u+4 = 0 \quad \text{or} \quad u-3 = 0 \\
 & u = -4 \quad u = 3 \\
 & (2x-1)^{1/3} = -4 \quad (2x-1)^{1/3} = 3 \\
 & [(2x-1)^{1/3}]^3 = [-4]^3 \quad [(2x-1)^{1/3}]^3 = [3]^3 \\
 & 2x-1 = -64 \quad 2x-1 = 27 \\
 & 2x = -63 \quad 2x = 28 \\
 & x = -\frac{63}{2} = -31\frac{1}{2} \quad x = 14
 \end{aligned}$$