

30.4. Solving Radical Equations

10F1

Solve the indicated radical equations for real x . Check your solutions in the original equation.

(1) $\sqrt{x-7} = -4$

no solution \leftarrow the square root cannot be negative

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

$x-7=16$, $x=23$ ✓

(3) $\sqrt{x+7} = 4x-5$

$x+7 = (4x-5)^2 = 16x^2 - 40x + 25$, $16x^2 - 41x + 18 = 0$

$$x = \frac{41 \pm \sqrt{(-41)^2 - 4(16)(18)}}{2(16)} = \frac{41 \pm \sqrt{529}}{32} = \frac{41 \pm 23}{32}$$

$x = \frac{41-23}{32} = \frac{18}{32} = \frac{9}{16}$ ✗ $x = \frac{41+23}{32} = \frac{64}{32} = 2$ ✓

(4) $\sqrt{x+7} + \sqrt{x+11} = 6$

$x+7 + 2\sqrt{x+7}\sqrt{x+11} + x+11 = 36$, $2x+18 + 2\sqrt{x^2+18x+77} = 36$,

$2\sqrt{x^2+18x+77} = -2x+18$, $\sqrt{x^2+18x+77} = -x+9$,

$x^2+18x+77 = x^2-18x+81$, $36x=4$, $x=\frac{4}{36}=\frac{1}{9}$ ✓