

7.6-solving radical equations

Solve each equation for x (make sure to check solutions)

1) $(\sqrt[3]{x-2} = 3)^3$

$$x-2 = 3^3$$

$$x-2 = 27$$

$$x = 29$$

check

$$\sqrt[3]{29-2} \stackrel{?}{=} 3$$

$$\sqrt[3]{27} \stackrel{?}{=} 3$$

$$3 = 3 \quad \checkmark$$

2) $3x^{\frac{1}{2}} + 12 = 9$

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

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

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

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

$$x = 1$$

← principal square roots must be positive so NO real solution

check

$$3(1)^2 + 12 \stackrel{?}{=} 9$$

$$3 + 12 \stackrel{?}{=} 9$$

 \Rightarrow so NO solution

$$15 \neq 9$$

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

$$\sqrt{5-x} = x-3$$

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

$$5-x = x^2 - 6x + 9$$

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

$$0 = (x-4)(x-1)$$

$$\cancel{x=1} \text{ or } \boxed{x=4}$$

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check:

$$3 + \sqrt{5-4} \stackrel{?}{=} 4 \quad \textcircled{4}$$

$$3 + \sqrt{1} \stackrel{?}{=} 4$$

$$4 = 4 \quad \checkmark$$

$$3 + \sqrt{5-1} \stackrel{?}{=} 1$$

$$3 + \sqrt{4} \stackrel{?}{=} 1 \quad \textcircled{1}$$

$$3 + 2 \neq 1 \quad \times$$

$$4) \sqrt{x-1} = \sqrt{x-9}$$

$$(\sqrt{x-1})^2 = (\sqrt{x-9})^2$$

$$x-1 = x-9$$

$$x-1 = x-9$$

$$8 = -2\sqrt{x-9}$$

$$[4] = (\sqrt{x-9})^2$$

$$16 = x-9$$

$$\boxed{25 = x}$$

check:

$$\sqrt{25-1} \stackrel{?}{=} \sqrt{25-9}$$

$$4 = \sqrt{16}$$

$$4 = 4 \quad \checkmark$$

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