

Radical Equations

Solve the equation.

1. $\sqrt{x-9} = 5$

$$x = 34$$

2. $\sqrt{3x} = 6$

$$x = 12$$

3. $\sqrt{x+3} = x+1$

4. $\sqrt{(15x+10)} = 2x+3$

$$x = 1$$

5. $(x+4)^{\frac{1}{2}} = 6$

$$x = -\frac{1}{4}, 1$$

7. $(x-6)^{\frac{1}{2}} = x-2$

$$\text{NO SOLUTION}$$

$$x = 32$$

9. $5 - \sqrt[3]{x-4} = 2$

10. $2\sqrt[3]{3x+2} = \sqrt[3]{4x-9}$

$$x = 31$$

13. $(x+7)^{\frac{1}{3}} = (4x)^{\frac{1}{3}}$

$$x = -\frac{5}{4}$$

14. $(5x+1)^{\frac{1}{4}} = 4$

$$x = \frac{7}{3}$$

$$x = 51$$

16. $2(x-1)^{\frac{1}{5}} = (2x-17)^{\frac{1}{5}}$

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

- 18. Anatomy** The surface area S of a human body in square meters can be approximated by $S = \sqrt{\frac{hm}{36}}$ where h is height in meters and m is mass in kilograms. A basketball player with a height of 2.1 meters has a surface area of about 2.7 m^2 . What is the player's mass?

$$2.7 = \sqrt{\frac{2.1m}{36}} \quad m = 125 \text{ kg}$$

- 20. Amusement Parks** For a spinning amusement park ride, the velocity v in meters per second of a car moving around a curve with radius r meters is given by $v = \sqrt{ar}$ where a is the car's acceleration in m/s^2 . If the ride has a maximum acceleration of 30 m/s^2 and the cars on the ride have a maximum velocity of 12 m/s , what is the smallest radius that any curve on the ride may have?

$$12 = \sqrt{30r} \quad r = 4.8 \text{ m}$$

- 23. Explain the Error** Below is a student's work in solving the equation $2\sqrt{3x+3} = 12$. What mistake did the student make? What is the correct solution?

$$\begin{aligned} 2\sqrt{3x+3} &= 12 \\ 2(\sqrt{3x+3})^2 &= 12^2 \\ 2(3x+3) &= 144 \\ 6x+6 &= 144 \\ x &= 23 \end{aligned}$$

Didn't ~~the~~ square the leading 2

$$\begin{aligned} 4(3x+3) &= 144 \\ 12x+12 &= 144 \\ 12x &= 132 \\ \boxed{x=11} \end{aligned}$$

Review

1. Given the zero $x = -3i$, find the remaining zeros of $h(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18$

$$\begin{array}{r|rrrrr} -3i & 3 & 5 & 25 & 45 & -18 \\ & \downarrow & -9i & -27+15i & -45+45i & 18 \\ \hline 3i & 3 & 5-9i & -2-15i & 0i & 0 \\ & \downarrow & 9i & 15i & 0i & \\ \hline & 3x^2+5x & -2 & & & \end{array}$$

$$x = \frac{-5 \pm \sqrt{25 - 4(3)(-2)}}{2(3)} = \frac{-5 \pm 7}{6} \left\{ \begin{aligned} \frac{-5+7}{6} &= \frac{1}{3} \\ \frac{-5-7}{6} &= -2 \end{aligned} \right.$$

$$\boxed{x = \frac{1}{3}, -2, \pm 3i}$$

2. Given the zeros, $x = 1+2i$ and $x = -2$, write a function in factored form.

$$\begin{aligned} &(x - (1+2i))(x - (-2i))(x + 2) \\ \boxed{f(x) = (x - 1 - 2i)(x - 1 + 2i)(x + 2)} \end{aligned}$$