

Rational Exponent Equations

Steps:

1. isolate the power on one side of the equation
2. raise each side of the equation to the reciprocal of the rational exponent
3. solve for the variable
4. check your solution!

$$1.) x^{\frac{2}{3}} - 2 = 25$$

$$\begin{array}{c} +2 \\ +2 \end{array}$$

$$(x^{\frac{2}{3}})^{\frac{3}{2}} = (27)^{\frac{3}{2}}$$

$$x = (27)^{\frac{3}{2}}$$

$$x = (\sqrt[3]{27})^2$$

$$x = (3)^2$$

$$\boxed{x = 9}$$

special case

$$3.) x^{\frac{2}{3}} - 9 = 16$$

$$\begin{array}{c} +9 \\ +9 \end{array}$$

$$(x^{\frac{2}{3}})^{\frac{3}{2}} = (25)^{\frac{3}{2}}$$

$$x = (\sqrt{25})^3$$

$$x = (\pm 5)^3$$

$$\boxed{x = 125 \text{ or } -125}$$

I physically drew in the square root $\Rightarrow \pm$

$$2.) 2x^{\frac{3}{4}} - 14 = 40$$

$$\begin{array}{c} +14 \\ +14 \end{array}$$

$$\frac{2x^{\frac{3}{4}}}{2} = \frac{54}{2}$$

$$(x^{\frac{3}{4}})^{\frac{4}{3}} = (27)^{\frac{4}{3}}$$

$$\boxed{x = 81}$$

$$x = (\sqrt[3]{27})^4$$

$$x = (3)^4 = 81$$

$$4.) (x - 27)^{\frac{2}{3}} = 64$$

$$\left[(x - 27)^{\frac{2}{3}} \right]^{\frac{3}{2}} = (64)^{\frac{3}{2}}$$

$$x - 27 = (64)^{\frac{3}{2}}$$

$$x - 27 = (\sqrt[3]{64})^2$$

$$x - 27 = (4)^2$$

$$\begin{array}{c} x - 27 = 16 \\ +27 \quad +27 \end{array}$$

$$\boxed{x = 43}$$