

Sec 1.6.3

Solving Equations with Rational Exponents

(i.e. exponents are fractions)

-Main Idea-

Remember the exponent rule for power to a power...multiply

$$(X^2)^3 = X^6$$

$$\text{SO } (X^{1/2})^2 = X^1$$

We need
 x^1 so
raise to
reciprocal
power

Some background info...

roots and radicals...
...are the same operation

For example-

$$\sqrt[n]{X^m} = X^{m/n}$$

$$\sqrt{X^3} = X^{3/2}$$

$$\sqrt[3]{2^4} = 2^{4/3}$$



Solve - $3x^{3/4} - 6 = 0$

$$3x^{3/4} = 6$$
$$(x^{3/4})^{4/3} = (2)^{4/3}$$

$$x \approx 2.519$$

When raising to an EVEN power
(just like our last lesson, squaring both sides)
ALWAYS check for extraneous. Here we raised
to the 4th power.

$$X^{2/3} - 3/4 = -1/2$$

$$\left(X^{2/3}\right)^{3/2} = \left(1/4\right)^{3/2}$$
$$= \pm 1/8$$

math → enter → enter

We took a square root, so we need to DOUBLE the root

$$\left[(2x+5)^{1/2} = 4 \right]^2$$

$$2x+5=16$$

$$2x=11$$

$$x=11/2$$

$$\left[2\left(\frac{11}{2}\right)+5 \right]^{1/2}$$
$$\frac{11+5}{16}^{1/2}=4$$

✓

check for extraneous!

$$5(x-8)^{3/4} = 40$$

$$\left[(x-8)^{3/4} = 8 \right]^{4/3}$$

$$x-8 = 16$$

$$x = 24$$

$$\begin{aligned} & 5(24-8)^{3/4} \\ & 5(16)^{3/4} \\ & 5(8) = 40 \end{aligned}$$

check for extraneous!

$$(x^2 + 5x + 5)^{5/2} + 1 = 0$$

$$\left[(x^2 + 5x + 5)^{5/2} = -1 \right]^{2/5}$$

$$x^2 + 5x + 5 = 1$$

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

check
for extraneous!

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

no
solution

$$x = \cancel{-4} \text{ \& \cancel{1}}$$

$$(x^2 + 5x + 5)^{5/2} + 1 = 0$$

$$(16 - 20 + 5)^{5/2} + 1 = 0$$

$$1^{5/2} + 1 = 0$$

$$1 + 1 \neq 0 \leftarrow$$

$$(-5 + 5)^{5/2} + 1 = 0$$

$$1^{5/2} + 1$$

$$2 \neq 0$$

Suggested Practice



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31-40

31. 4

35. $4^{1/5}$ or $\sqrt[5]{4}$ $2^{2/5}$

32. 9

36. $27^{1/5}$ or $\sqrt[5]{27}$ $3^{3/5}$

33. 13

37. -60, 68

34. -1

38. $\{-13, 3\}$

39. -4, 5 $\left\{ \begin{matrix} 40 \\ 1, 2 \end{matrix} \right\}$

Is your #37 or #38 in correct?
WHEN did you take an even root?
THAT is when you double the root.