7.6 Equations with Rational Exponents or Radicals

std. 12.0

To solve an equation with a rational exponent:

- *isolate the variable*
- *raise both sides of equation to the reciprocal power of the variable*
- *solve for the variable*
- *check for extraneous solutions*

ex. 1 $6x^{-2/7} = 24$

$\left(x^{-2/7}\right)^{-7/2} = \left[4\right]^{-7/2}$

$x = \frac{1}{4^{7/2}} = \frac{1}{\left(\sqrt{4}\right)^7} = \frac{1}{128}$

check: $6 \cdot 128^{2/7}$, $6\left(\sqrt[7]{128}\right)^2$, $6 \cdot 4$

ex. 2 $(x-4)^{5/2} - 3 = 29$

$\left[(x-4)^{5/2}\right]^{2/5} = \left[32\right]^{2/5}$

$x - 4 = \left(\sqrt[5]{32}\right)^2$

$x = 4 + 4 = 8$

check: $\left(\sqrt{4}\right)^5 - 3$

To solve an equation with radicals:

- *isolate radical or split up radicals*
- *raise both sides to a power to undo the root*
- *solve for the variable*
- *check for extraneous solutions*

ex. 3 $\sqrt[3]{2x+1} - 4 = 0$

$\left(\sqrt[3]{2x+1}\right)^3 = \left(4\right)^3$

$2x + 1 = 64$

$x = \frac{63}{2}$

32.5

check: $\sqrt[3]{64} - 4$, $4 - 4$, 0

ex. 4 $\sqrt{x-5} + 7 = x$

$\left(\sqrt{x-5}\right)^2 = (x-7)^2$

$x - 5 = x^2 - 14x + 49$

$0 = x^2 - 15x + 54$

$0 = (x-6)(x-9)$

$x = 6, 9$

9 extraneous

CK 6: $\sqrt{1} + 7 = 6$ F

CK 9: $\sqrt{4} + 7 = 9$ T

ex. 5 $\sqrt{x} + \sqrt{x+16} = 8$

$(\sqrt{x+16})^2 = (8 - \sqrt{x})^2$

$x + 16 = 64 - 16\sqrt{x} + x$

$-48 = -16\sqrt{x}$

$3 = \sqrt{x}$

$9 = x$