Radical Equations

Goal: to solve radical equations.

(14) Solve

a) $\sqrt[5]{3x+1} + 2 = 7$ ✓

$-2 \quad -2$

$\left(\sqrt[5]{3x+1}\right)^5 = (5)^5$

$3x+1 = 25$

$3x = 24$

$x = 8$ ✓

Steps for a single √

1. Isolate √
2. □ both sides
3. solve
4. check

b) $\sqrt[3]{x+3} + \sqrt[5]{x+19} = 8$

$-\sqrt{x+19} \quad -\sqrt{x+19}$

$\left(\sqrt[3]{x+3}\right)^3 = \left(8 - \sqrt{x+19}\right)^3$

A B

$x+3 = 64 - 16\sqrt{x+19} + (x+19)$

$x+3 = 83 - 16\sqrt{x+19} + x$

$-x-83 \quad -83 \quad -x$

Steps for a single √

1. Isolate √'s
2. □ both sides
3. simplify and isolate √
4. □ both sides again
5. check

$x+3 = 83 - 16\sqrt{x+19} \quad -x$

$-x-83 \quad -83$

$-80 = -16\sqrt{x+19}$

$\frac{-80}{-16} = \frac{-16\sqrt{x+19}}{-16}$

$5^2 = \left(\sqrt{x+19}\right)^2$

$25 = x+19$

$x = 6$ ✓

(5) check

$(A-B)^2 = A^2 - 2AB + B^2$

c) $\left(\sqrt[3]{4x+9}\right)^3 = \left(\sqrt[3]{5-2x}\right)^3$

$4x+9 = 5-2x$

$+2x \quad -9 \quad -9 \quad +2x$

$6x = -4$

$x = \frac{-4}{6} = \frac{-2}{3}$ ✓

d) $x^{\frac{1}{4}} - 2 = 1$

$+2 \quad +2$

$x^{\frac{1}{4}} = 3$

$\left(x^{\frac{1}{4}}\right)^4 = 3^4$

$x^1 = 81$

$x = 81$ ✓

e) $\left[2\cdot(4-y)^{\frac{1}{4}}\right]^4 = \left[6^{\frac{1}{4}}\right]^4$

$2^4\left[(4-y)^{\frac{1}{4}}\right]^4 = 6$

$16(4-y)^1 = 6$

$\frac{64}{2} - \frac{16y}{2} = \frac{6}{2}$

$32 - 8y = 3$

$-8y = -29$

$y = \frac{29}{8}$

You Try It!

$4 + \sqrt[4]{5-x}^{1} = x^{4} + 1$

$-4 \qquad\qquad -4$

$\left(\sqrt[4]{5-x}\right)^4 = (x-3)^4$

$5 - x = x^4 - 6x + 9$

$-5 + x \qquad + x \quad -5$

$(A-B)^2 = A^2 - 2AB + B^2$

$-5+x \qquad +x \quad 5$

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

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

$x = 1$ or $x = 4$

extraneous