# Radical Equations

Solve.

$$\sqrt{3x+4} - \sqrt{x+2} = 2$$

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

$$3x+4 = 4 + 2\sqrt{x+2} + 2\sqrt{x+2} + x+2$$

$$3x+4 = 6 + x + 4\sqrt{x+2}$$

$$-x-6$$

$$\left(2x-2\right)^2 = \left(4\sqrt{x+2}\right)^2$$

$$(2x-2)(2x-2)$$

$$4x^2 - 8x + 4 = 16(x+2)$$

$$4x^2 - 8x + 4 = 16x + 32$$

$$4x^2 - 24x - 28 = 0$$

$$4(x^2 - 6x - 7) = 0$$

$$4(x-7)(x+1) = 0$$

$$x = 7, \cancel{-1}$$

← check in original problem!

$x=7$ $\sqrt{25} - \sqrt{9} = 2$
$5 - 3 = 2$
$\checkmark 2 = 2$

$x = -1$ $\sqrt{1} - \sqrt{1} = 2$
$1 - 1 \neq 2$

# PARTIAL FRACTIONS

purpose
to find the original fractions that were combined to make the given fraction.

$$\frac{(x-4)2}{(x-4)x+3} + \frac{6(x+3)}{x-4(x+3)} = \frac{2x-8+6x+18}{(x+3)(x-4)} = \frac{8x+10}{(x+3)(x-4)} = \frac{8x+10}{x^2-x-12}$$

$$\frac{8x+10}{x^2-x-12}$$

$$\frac{(x-4)}{(x+3)}\left[\frac{8x+10}{(x-4)(x+3)} = \frac{A(x-4)(x+3)}{x-4} + \frac{B(x-4)(x+3)}{x+3}\right]$$

$$8x+10 = A(x+3) + B(x-4)$$

$$8x+10 = Ax+3A + Bx-4B$$

$$8 = A+B$$
$$10 = 3A-4B$$

$$\begin{bmatrix} A & B \\ 1 & 1 \\ 3 & -4 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 8 \\ 10 \end{bmatrix} = \begin{bmatrix} 6 \\ 2 \end{bmatrix}$$

$$\boxed{\frac{6}{x-4} + \frac{2}{x+3}}$$

$$\frac{}{(x+3)(x-2)} = \frac{A}{x+3} + \frac{B}{x-2}$$

$$\frac{}{(x^2+4)(x^3+7)} = \frac{Ax^1+B}{x^2+4} + \frac{Cx^2+Dx+E}{x^3+7}$$

$$\frac{}{(x-5)^2(x+3)} = \frac{A}{(x-5)^2} + \frac{B}{x-5} + \frac{C}{x+3}$$

$$\frac{}{x^3(4x+1)} = \frac{A}{x^3} + \frac{B}{x^2} + \frac{C}{x^1} + \frac{D}{4x+1}$$

$$(x-0)^3 \quad (x-0)^2 \quad (x-0)^1$$

$$\frac{10x^2 + 24x + 8}{(x^3 + 3x^2 + 4x + 12)}$$

$$x^2(x+3) + 4(x+3)$$

$$(x+3) \atop (x^2+4)} \left[ \frac{10x^2 + 24x + 8}{(x+3)(x^2+4)} = \frac{A}{x+3}^{(x+3)(x^2+4)} + \frac{Bx+C}{x^2+4}^{(x+3)(x^2+4)} \right]$$

$$10x^2 + 24x + 8 = A(x^2+4) + (Bx+c)(x+3)$$

$$10x^2 + 24x + 8 = Ax^2 + 4A + Bx^2 + 3Bx + Cx + 3C$$

$$10 = A + B$$
$$24 = \quad 3B + C$$
$$8 = 4A \quad + 3C$$

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 3 & 1 \\ 4 & 0 & 3 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 10 \\ 24 \\ 8 \end{bmatrix}$$

$$= \begin{bmatrix} 2 \\ 8 \\ 0 \end{bmatrix}$$

$$\boxed{\frac{2}{x+3} + \frac{8x}{x^2+4}}$$

If:

$$0x^2 \; 4x + 9 = Ax^2 + Bx - 4B + Cx - 5C$$

$$0 = A$$
$$4 = B + C$$
$$9 = -4B - 5C$$