Radical Equations

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

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

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

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

$-x \quad -6$

Clean Up!

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

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

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

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

$-16x \quad -32$

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

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

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

$x = 7, -1$

$x=7 \quad x=-1$

$\sqrt{25} - \sqrt{9} = 2$

$5 - 3 = 2$

$2 = 2$ ✓

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

$1 - 1 = 2$

PARTIAL FRACTIONS

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

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

$$\boxed{\frac{8x+10}{(x-4)(x+3)} = \frac{A}{x-4} + \frac{B}{x+3}}$$

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

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

$$8 = A + B$$

$$10 = 3A - 4B$$

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

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

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

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

$$\frac{\quad}{(x-5)^2(x+3)} = \frac{A}{(x-5)^2} + \frac{B}{(x-5)^1} + \frac{C}{x+3}$$

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

$(x-0)^3$

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

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

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

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

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

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

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

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

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 3 & 1 \\ 4 & 0 & 3 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 10 \\ 24 \\ 8 \end{bmatrix} = \begin{bmatrix} 2 \\ 8 \\ 0 \end{bmatrix}$$