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

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

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

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

$-3x \quad -4 \quad +4 \quad -3x$

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

$(\div -2) \quad \frac{-2x}{-2} = \frac{-4\sqrt{3x}}{-2}$

$(x)^2 = (2\sqrt{3x})^2$

$x^2 = 4 \cdot 3x$

$x^2 - 12x = 0$

$x(x-12) = 0$

$x=0 \quad x=12$

Ck: $x=0$

$\sqrt{4} - \sqrt{0} = -2$

$2 = -2$

Reject!

$x=12$

$\sqrt{16} - \sqrt{36} = -2$

$4 - 6 = -2$

$-2 = 2$ ✓

23. $(x^2-6x)^2 + 13(x^2-6x) + 40 = 0$

$[(x^2-6x)+8][(x^2-6x)+5] = 0$

$(x^2-6x+8)(x^2-6x+5) = 0$

$(x-4)(x-2)(x-5)(x-1) = 0$

$x=4 \quad x=2 \quad x=5 \quad x=1$

24. $\frac{x^2-12}{x} - \frac{20x}{x^2-12} = 1$

Let $u = \frac{x^2-12}{x} \quad \frac{1}{u} = \frac{x}{x^2-12}$

$u\left(u - 20 \cdot \frac{1}{u}\right) = u(1)$

$u^2 - 20 = u$

$u^2 - u - 20 = 0$

$(u-5)(u+4) = 0$

$u=5 \quad u=-4$

$x \cdot \frac{x^2-12}{x} = 5x \quad x \cdot \frac{x^2-12}{x} = -4x$

$x^2 - 12 = 5x \quad x^2 - 12 = -4x$

$x^2 - 5x - 12 = 0 \quad x^2 + 4x - 12 = 0$

$a=1 \; b=-5 \; c=-12 \quad (x+6)(x-2) = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} \quad x=-6 \quad x=2$

$= \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-12)}}{2(1)}$

$= \frac{5 \pm \sqrt{25+48}}{2} = \frac{5 \pm \sqrt{73}}{2}$