Extraneous Solution Handout 1

Equations with Rational Expressions

An extraneous solution to an equation with rational expressions is a solution that causes a denominator to equal zero.

Example:

$$\frac{1}{x+4}+\frac{x}{x-4}=\frac{-8}{x^2-16}$$

$$\frac{1}{x+4}+\frac{x}{x-4}=\frac{-8}{(x+4)(x-4)}$$

$$LCD=(x+4)(x-4)$$

$$(x+4)(x-4)\left(\frac{1}{x+4}\right)+(x+4)(x-4)\left(\frac{x}{x-4}\right)=(x+4)(x-4)\left(\frac{-8}{(x+4)(x-4)}\right)$$

$(x-4)+x(x+4)=-8$ ← Distribute

$x-4+x^2+4=-8$ ← Collect like terms

$x^2+5x-4=-8$ ← Set equal to zero

$x^2+5x+4=0$ ← Factor

$(x+4)(x+1)=0$ ← Set each factor to zero

$x+4=0$ $\quad$ $x+1=0$ ← Solve for x.

$x=-4$ $\quad$ $x=-1$

Since the solution $x=-4$ causes the denominator to equal zero, we call this an extraneous solution. Therefore, the answer is $x=-1$.