

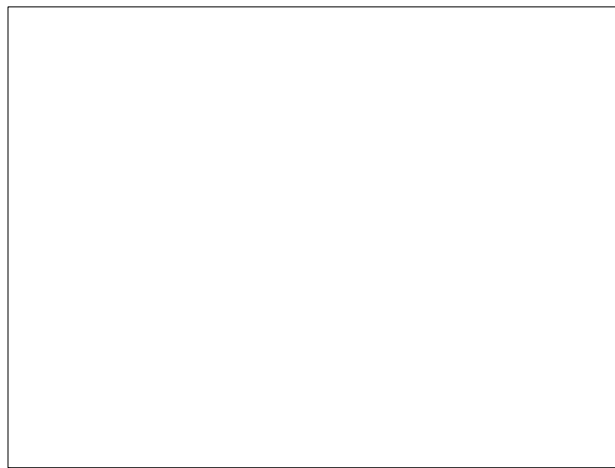
WU
GRAPH and State Domain, Range, Vertical and Horizontal Asymptotes.

1. $y = \frac{-4}{x+2} - 1$
 D: $x \neq -2$
 R: $y \neq -1$

2. $y = \frac{4x+3}{2x-6}$
 D: $x \neq 3$
 R: $y \neq 2$

3. FACTOR FLIP HACK
 Divide: $\frac{7x}{2x-10} \div \frac{x^2 \cdot x(x-6)}{x^2 - 11x + 30}$
 $\frac{7x}{2(x-5)} \cdot \frac{(x-5)(x-6)}{x(x-6)} = \frac{7}{2}$

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8.6 Solve Rational Equations

you can only cross multiply when there's 1 thing term on each side of =.

EXAMPLE 1 Solve a rational equation by cross multiplying

Solve: $\frac{3}{x+1} = \frac{9}{4x+5}$
 Write original equation.
 $\frac{3}{x+1} = \frac{9}{4x+5}$
 Cross multiply.
 $3(4x+5) = 9(x+1)$
 Distributive property.
 $12x + 15 = 9x + 9$
 Subtract 9x from each side.
 $3x + 15 = 9$
 Subtract 15 from each side.
 $3x = -6$
 Divide each side by 3.
 $x = -2$

► The solution is -2. Check this in the original equation.

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If you cant cross multiply - Solve a Rational Function by Using LCD

2nd IF YOU ARE SOLVING - Multiply EVERY TERM by LCD! and go Hack Happy

Least Common Denominator

Ex 2 $\frac{7}{2} + \frac{3}{x} = 3$

Find LCD/LCM - Need to account for each term in denominator.
 LCD = 2x

$\frac{2x}{1} \cdot \frac{7}{2} + \frac{3}{x} \cdot 2x = 3 \cdot \frac{2x}{1}$
 mult every term by LCD & cancel!

$7x + 6 = 6x$
 $x + 6 = 0$
 $x = -6$
 ← you will eliminate the denominator.

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Ex 3

$\frac{3x}{x+1} - \frac{5}{2x} = \frac{3}{2x}$

Find LCD
 (x+1)2x

$\frac{(x+1)2x}{1} \cdot \frac{3x}{x+1} - \frac{5(2x)}{2x} = \frac{3(x+1)2x}{2x}$

$6x^2 - 5(x+1) = 3(x+1)$
 $6x^2 - 5x - 5 = 3x + 3$
 $6x^2 - 8x - 8 = 0$
 $3x^2 - 4x - 4 = 0$
 $(3x+2)(x-2) = 0$
 $x = -\frac{2}{3}$ or $x = 2$

Sometimes you must factor at the end to solve

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EXAMPLE 4 Solve a rational equation with two solutions

Solve: $1 - \frac{8}{x-5} = \frac{3}{x}$
 Write original equation.
 $1 - \frac{8}{x-5} = \frac{3}{x}$
 Multiply each side by the LCD, $x(x-5)$.
 $x(x-5) \left(1 - \frac{8}{x-5} \right) = x(x-5) \cdot \frac{3}{x}$
 Simplify.
 $x(x-5) - 8x = 3(x-5)$
 Simplify.
 $x^2 - 5x - 8x = 3x - 15$
 Write in standard form.
 $x^2 - 16x + 15 = 0$
 Factor.
 $(x-1)(x-15) = 0$
 Zero product property
 $x = 1$ or $x = 15$

► The solutions are 1 and 15. Check these in the original equation.

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EXAMPLE 5 Check for extraneous solutions

Solve: $\frac{6}{x-3} = \frac{8x^2}{x^2-9} - \frac{4x}{x+3}$

you may need to factor the denominator first!

Solution
Write each denominator in factored form. The LCD is $(x+3)(x-3)$.

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

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

$$6(x+3) = 8x^2 - 4x(x-3)$$

$$6x + 18 = 8x^2 - 4x^2 + 12x$$

$$0 = 4x^2 + 6x - 18$$

$$0 = 2x^2 + 3x - 9$$

$$0 = (2x-3)(x+3)$$

$$2x-3 = 0 \quad \text{or} \quad x+3 = 0$$

$$x = \frac{3}{2} \quad \text{or} \quad x = -3$$

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PRACTICE 4

Solve the equation by using the LCD. Check for extraneous solutions.

5. $\frac{7}{2} + \frac{3}{x} = 3$ 6. $\frac{2}{x} + \frac{4}{3} = 2$ 7. $\frac{3}{7} + \frac{8}{x} = 1$

8. $\frac{3}{2} + \frac{4}{x-1} = \frac{x+1}{x-1}$ 9. $\frac{3x}{x+1} - \frac{5}{2x} = \frac{3}{2x}$ 10. $\frac{5x}{x-2} = 7 + \frac{10}{x-2}$

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