Monday, September 17, 2018
5:19 PM

KEY

PreCalculus Summer Assignment Review **Day 6 – Rational Expressions and Equations**

Simplify Rational Expressions https://youtu.be/i7w_aRlVagU
Multiply/Divide Rational Expressions https://youtu.be/oUaIdqhCyTU
Add/Subtract Rational Expressions https://youtu.be/FZdt73khrxA?t=1m48s
Solve Rational Equation using LCD https://youtu.be/4-a6tkwHZEM

Operations with Rational Expressions/Equations

Multiply

- **Factor** numerators and denominators
- Identify **restrictions**
- **Divide/cancel** common factors (if in numerator and denominator)

Divide

- **Keep-change-flip** (turn into multiplication)
- Multiply (*see steps to Multiply*)

Add/Subtract

- Same denominators?
  - Combine numerators (*combine like-terms*)
    - ***SUBTRACTION: DISTRIBUTE NEGATIVE
  - **Factor** and simplify
- Different denominators?
  - **Factor** all denominators
  - Find LCD (if terms share a factor, use once/all factors need to be used)
  - **Expand** each term so they have LCD (*multiply* by what is "missing")
  - Multiply/distribute/foil and **combine like-terms** in numerator
    - ***SUBTRACTION: DISTRIBUTE NEGATIVE
  - **Factor** and simplify

Equations

- Factor denominators and find **LCD** of all terms (identify **restrictions**)
- Multiply *every term* by LCD to **clear denominator**
- Multiply/distribute/FOIL where needed
- Combine like terms and **solve** (check for *extraneous solutions*)

Simplify each expression. State any domain restrictions.

1. $\frac{12m^3n^7}{18mn^8} = \frac{2m}{3n}$

Domain Restrictions! $m \neq 0$, $n \neq 0$

2. $\frac{x^2-6x+8}{20-5x} = \frac{(x-4)(x-2)}{5(4-x)} = \frac{(x-4)(x-2)}{-5(-4+x)} = \frac{(x-4)(x-2)}{-5(x-4)} = \frac{x-2}{-5}$ or $-\frac{x-2}{5}$ or $\frac{2-x}{5}$, $x \neq 4$

3. $\frac{1}{x+2}+\frac{5}{x-2}$ (LCD $(x-2)(x+2)$) $= \frac{x-2}{(x-2)(x+2)} + \frac{5x+10}{(x-2)(x+2)} = \frac{6x+8}{(x-2)(x+2)} = \frac{2(3x+2)}{(x-2)(x+2)}$, $x \neq \pm 2$

4. $\frac{y}{2y-1}+\frac{3}{1-2y} = \frac{y}{2y-1} - \frac{3}{2y-1}$ ($-2y+1$, $-(2y-1)$) $= \frac{y-3}{2y-1}$

Restriction: $2y-1 \neq 0$, $2y \neq 1$, $y \neq \frac{1}{2}$

*FACTOR! $5(y^2-4)$
$5(y+2)(y-2)$

5. $\frac{2}{3x-5} - 8$ $\cdot \frac{(3x-5)}{(3x-5)}$

$\frac{2}{3x-5} - \frac{24x-40}{3x-5} = \frac{-24x+42}{3x-5}$

$= \frac{-6(4x-7)}{3x-5}$

$3x-5 \neq 0$
$3x \neq 5$
$x \neq 5/3$

6. $\frac{5y^2-20}{y^3+2y^2+y+2} \div \frac{7y}{y^3+y}$ Keep, change, flip

$y^2(y+2)+1(y+2)$
$(y^2+1)(y+2)$

$x \neq 0, -2$

$\frac{5(y+2)(y-2)}{(y^2+1)(y+2)} \cdot \frac{y(y^2+1)}{7y} = \frac{5(y-2)}{7}$

7. $\frac{4-y}{5} \div \frac{2y-8}{15}$ ⇄

$\frac{4-y}{5} \cdot \frac{15}{2(y-4)} = \frac{-(y-4)}{5} \cdot \frac{3\ 15}{2(y-4)}$

$= \frac{-3}{2}$

$y \neq 4$

8. $\frac{2w}{21} \div \frac{3w^2}{7} \cdot \frac{4}{w}$ only flip for ÷

$\frac{2w}{3\ 21} \cdot \frac{7}{3w^2} \cdot \frac{4}{w} = \frac{8}{9w^2}$

$w \neq 0$

Solve each equation. (*on separate paper*) * WORK on next pg

9. $\frac{3}{x+2} = \frac{6}{x-1}$

10. $\frac{x+3}{x^2-x} - \frac{8}{x^2-1} = 0$

11. $\frac{y}{y+3} + \frac{3}{y-3} = \frac{18}{y^2-9}$

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

13. $\frac{7}{z+1} - \frac{z-5}{z^2-1} = \frac{6}{z}$

14. $\frac{4y}{y+2} - \frac{y}{y-1} = \frac{9}{y^2+y-2}$

Answers: *Precalculus Summer Assignment Review: Day 6 - Rational Expressions and Equations*

1) $\frac{2m^2}{n}, m \neq 0, n \neq 0$

2) $-\frac{x-2}{5}$ *or* $\frac{2-x}{5}, x \neq 4$

3) $\frac{2(3x+2)}{(x-2)(x+2)}, x \neq \pm 2$

4) $\frac{y-3}{2y-1}, y \neq \frac{1}{2}$

5) $\frac{-6(4x-7)}{3x-5}, x \neq \frac{5}{3}$

6) $\frac{5(y-2)}{7}, y \neq -2, 0$

7) $-\frac{3}{2}, y \neq 4$

8) $\frac{8}{9w^2}, w \neq 0$

9) $x = -5$

10) $x = 3$ (1 *extraneous*)

11) No solution (± 3 *extraneous*)

12) $x = -\frac{1}{3}$

13) $z = 3$

14) $y = 3, -1$

Solve each equation. (*on separate paper*)

9. $\frac{3}{x+2} = \frac{6}{x-1}$

$(x-1)(x+2)$ $\qquad$ $(x-1)(x+2)$

LCD = $(x-1)(x+2)$

MULT BOTH SIDES by LCD TO CLEAR fraction

$3x-3 = 6x+12$

$-3x = 15$

$\boxed{x = -5}$

10. $\frac{x+3}{x^2-x} - \frac{8}{x^2-1} = 0$

$x(x-1)(x+1)\left(\frac{x+3}{x(x-1)}\right) - \left(\frac{8}{(x+1)(x-1)}\right)^{x(x-1)(x+1)} = (0)^{x(x-1)(x+1)}$

LCD: $x(x-1)(x+1)$

$(x+1)(x+3) - 8x = 0$

$x^2 + 4x + 3 - 8x = 0$

$x^2 - 4x + 3 = 0$

$(x-3)(x-1) = 0$

$\boxed{x=3}$ $\quad$ $x=1$ extraneous

Restrictions on Domain:

$x \neq 0, 1, -1$

11. $\frac{y}{y+3} + \frac{3}{y-3} = \frac{18}{y^2-9}$

$(y+3)(y-3)\frac{y}{y+3} + \frac{(y+3)(y-3)}{y-3} = \frac{18}{(y+3)(y-3)}(y+3)(y-3)$

LCD: $(y+3)(y-3)$

$y^2 - 3y + 3y + 9 = 18$

$y^2 + 9 = 18$

$y^2 - 9 = 0$

$(y+3)(y-3) = 0$

$y=-3$ $\quad$ $y=3$ extraneous

$\boxed{\text{no solution}}$

Restrictions:

$y \neq -3, y \neq 3$

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

LCD: $(x+5)(x+1)$

Restrictions: $x \neq -5, -1$

$(x+1)(3x+1) = (x-1)(x+5) + 2(x+5)(x+1)$

$3x^2+4x+1 = x^2+4x-5+2[x^2+6x+5]$

$3x^2+4x+1 = x^2+4x-5+2x^2+12x+10$

$3x^2+4x+1 = 3x^2+16x+5$

$\frac{-12x}{-12} = \frac{4}{-12}$

$\boxed{x = -\frac{1}{3}}$

13. $\frac{7}{z+1} - \frac{z-5}{z^2-1} = \frac{6}{z}$

$z(z+1)(z-1)\frac{7}{z+1} - \frac{(z-5)}{(z+1)(z-1)}z(z+1)(z-1) = \frac{6}{z}z(z+1)(z-1)$

LCD: $(z+1)(z-1)z$

Restrictions: $z \neq -1, 1, 0$

$7z(z-1) - z(z-5) = 6(z+1)(z-1)$

$7z^2-7z-z^2+5z = 6(z^2-1)$

$6z^2-2z = 6z^2-6$

$-2z = -6$

$\boxed{z = 3}$

14. $\frac{4y}{y+2} - \frac{y}{y-1} = \frac{9}{y^2+y-2}$

$(y+2)(y-1)\frac{4y}{(y+2)} - \frac{y}{(y-1)}(y+2)(y-1) = \frac{9}{(y+2)(y-1)}(y+2)(y-1)$

LCD: $(y+2)(y-1)$

Restrictions: $y \neq -2, 1$

$4y(y-1) - y(y+2) = 9$

$4y^2-4y-y^2-2y = 9$

$3y^2-6y-9 = 0$

$3(y^2-2y-3) = 0$

$3(y-3)(y+1) = 0$

$\boxed{y = 3}$ $\boxed{y = -1}$