#### What's Going On?

Checking In Homework Logs

Minds on Rated "R" for Undefined

Action! Factor, Restrict, Simplify

Consolidation Working Backwards

Learning Goal - I will be able to simplify rational functions and determine their restrictions.

#### **Checking In**

# F.F.M.

Get your little books.

Factor.

$$6x^{2} - 20 + 26x$$

$$= 6x^{2} + 26x - 20$$

$$= 2(3x^{2} + 13x - 10)$$

$$= 2(3x^{2} - 2x + 15x - 10)$$

$$= 2(x(3x - 2) + 5(3x - 21)$$

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

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#### Minds on

### First, A Few New Terms



A <u>rational function</u> is any function that is the <u>ratio</u> of two polynomials.

A rational function can be expressed as

$$f(x) = \frac{R(x)}{S(x)}$$
 where R and S are polynomials and  $5 \neq 0$ .



A <u>rational expression</u> is a quotient of polynomials. All rational functions are also rational expressions.



Restrictions are all values of the variable(s) in a rational function or rational expression that cause the function to be undefined. These are the zeros of the denominator or, equivalently, the numbers that are not in the domain of the function.

#### Minds on

#### Rated "R" for Undefined

State any restrictions on the given functions.

$$f(x) = \frac{1}{x}$$
,  $\times \neq 0$ 

$$g(x) = \frac{1}{x-1} \quad | \quad \times \neq | \quad | \quad \times | \neq 0$$

$$h(x) = \frac{1}{2x+1}, x \neq -\frac{1}{2}$$
 $2x+1\neq 0$ 
 $2x+1\neq 0$ 
 $2x+1\neq 0$ 
 $2x+1\neq 0$ 
 $2x+1\neq 0$ 
 $2x+1\neq 0$ 

$$j(x) = \frac{-7}{3x-2}$$
 )  $\times \neq \frac{2}{3}$   $\times \neq 2$   $\times \neq 2$   $\times \neq 3$ 

$$k(x) = \frac{-7}{x^2 - 9}$$
,  $x \ne 3$ ,  $-3$   $x \ne 3$   
 $x \ne 3$ 

$$m(x) = \frac{x^{2} + 5x + 6}{x^{2} - x - 12}$$

$$m(x) = \frac{(x + 2)(x + 3)}{(x - 4)(x + 3)}$$

$$\frac{(x + 2)(x + 3)}{(x - 4)(x + 3)}$$

$$m(x) = \frac{(x+2)}{(x-4)}, x \neq 4, -3$$

# Factor, Restrict, Simplify

$$m(x) = \frac{x^2 + 5x + 6}{x^2 - x - 12}$$

# Factor, Restrict, Simplify

To simplify a rational function.

- 1. Factor
- 2. Note any restrictions
- 3. Divide by the GCF (simplify)
- 4. State restrictions

# Factor, Restrict, Simplify

# Factor, Restrict, Simplify

b) 
$$\frac{10x^4 - 8x^2 + 4x}{2x^2} \times 40$$

$$= \frac{2 \times (5 \times^3 - 4 \times + 2)}{\times 2 \times^2}$$

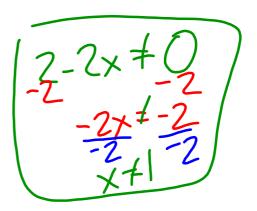
$$= \frac{5x^3 - 4x + 2}{\times 2} \times 40$$

# Factor, Restrict, Simplify

Simplify the rational function below and

state any restrictions.

c) 
$$\frac{x^2 + 7x - 8}{2 - 2x}$$
  
=  $\frac{(x+8)(x-1)}{2(1-x)}$   
=  $\frac{(x+8)(x-1)}{-2(x-1)}$   
=  $\frac{x+8}{-2}$ ,  $\frac{x+1}{x+1}$ 



# Factor, Restrict, Simplify

Simplify the rational function below and

state any restrictions.

tate any restrictions.

d) 
$$\frac{4x^2 - 16y^2}{x^2 + xy - 6y^2}$$

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

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

$$= \frac{4(x + 2y)(x + 2y)}{(x + 3y)(x - 2y)}$$

$$= \frac{4(x + 2y)}{(x + 3y)}$$

# Factor, Restrict, Simplify

e) 
$$P(n) = \frac{3n^3 - 3n^2}{8n^3 - 12n^2 + 4n}$$
  
 $P(n) = \frac{3n^2(n-1)}{4n(2n^2 - 3n + 1)}$   
 $P(n) = \frac{3n^2(n-1)}{4n(2n^2 - 2n - n + 1)}$   
 $P(n) = \frac{3n^2(n-1)}{4n(2n(n-1) - 1(n-1))}$   
 $= \frac{3n^2(n-1)}{4n(2n-1)(n-1)}$   
 $= \frac{3n^2(n-1)}{4n(2n-1)(n-1)}$   
 $= \frac{3n^2(n-1)}{4n(2n-1)(n-1)}$ 

### Consolidation

# Working Backwards

Create a rational expression with integer coefficients that simplifies to  $\frac{2x+1}{x-4}$ 

with the following restrictions:  $x \neq \frac{2}{3},4$ 

# Consolidation

Homework!

**Pg. 112**: 1 - 6, 8, 10

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