Warm Up

Simplify each expression. Assume all variables are nonzero.

1. $x^5 \cdot x^2$ x^7

2. $y^3 \cdot y^3$ y^6

3. $\frac{x^6}{x^2}$ x^4

4. $\frac{y^2}{y^5}$ $\frac{1}{y^3}$

Factor each expression.

5. $x^2 - 2x - 8$ $x^2+2x-4x-8$ $x(x+2)-4(x+2)$ $(x-4)(x+2)$

6. $x^2 - 5x$ $x(x-5)$

7. $x^5 - 9x^3$ $x^3(x^2-9) \Rightarrow x^3(x-3)(x+3)$

A **rational expression** is a quotient of two polynomials. Other examples of rational expressions include the following:

$$\frac{x^2-4}{x+2} \qquad \frac{10}{x^2-6} \qquad \frac{x+3}{x-7}$$

Steps to simplify:

- **Factor** numerator & denominator
- State **excluded values**
  - > Set each factor in the denominator equal to zero and solve.
- **Simplify** by canceling out like factors on top and bottom.

Simplifying Rational Expressions

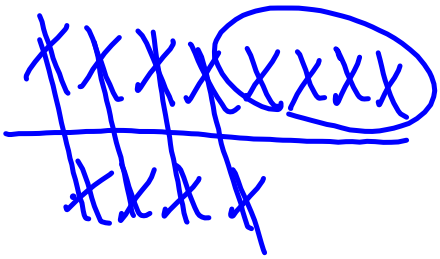
Simplify. Identify any *x*-values for which the expression is undefined.

$$\frac{10x^8}{6x^4} = \frac{5x^4}{3}$$

$6x^4 = 0$

$x = 0$

$x \neq 0$



Simplify. Identify any *x*-values for which the expression is undefined.

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

$x+3=0$

$x-1=0$

$$\frac{x+2}{x+3}$$

$x \neq -3, 1$

You Try: Simplify. Identify any *x*-values for which the expression is undefined.

A) $\frac{16x^{11}}{8x^2} = 2x^9$

$x \neq 0$

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

$x \neq -4/3, 1$

-12

$4 \cdot -3$

$(3x+4)(x-1)$

$\frac{1}{x-1}$

$(3x^2+4)(-3x-4)$

$x(3x+4) - 1(3x+4)$

$\rightarrow (3x+4)(x-1)$

Multiplying and Dividing Rational Expressions

Example 1:

$$\frac{n+9}{n+4} \cdot \frac{n^2+10n+24}{n+9} = n+6$$

$(n+6)(n+4)$

Restrictions on x: $n \neq -4, -9$

Example 2:

$$\frac{3x^2}{3x^3+12x^2} \cdot \frac{x^2-16}{3}$$

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

$$\frac{x-4}{3}$$

$3x^2 = 0$

$x = 0$

$x+4=0 \quad x=-4$

$3 \neq 0$

Restrictions on x: $x \neq -4, 0$

Example 3:

Keep - Change - Flip

$$\frac{n^2 - 8n - 9}{n - 7} \times \frac{n - 4}{n - 9}$$

$$\frac{(n-9)(n+1)}{n-7} \times \frac{n-4}{n-9}$$

$$\frac{(n+1)(n-4)}{n-7}$$

Restrictions on x: $n \neq 7, 9, 4$

Example 4:

$$\frac{n^2-16}{n^2-10n+24} \cdot \frac{n+4}{n+1}$$

$$(n-4)(n+4)$$

$$(n-6)(n-4)$$

$$\frac{n+1}{n+4}$$

$$= \frac{n+1}{n-6}$$

Restrictions on x: $n \neq 6, 4, -1, -4$

Attachments

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