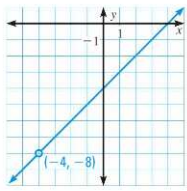## Warm UP

POINT DISCONTINUITY In Exercises 44–46, use the following information.

The graph of a rational function can have a hole in it, called a *point discontinuity*, where the function is undefined. An example is shown below.

$$y = \frac{x^2 - 16}{x + 4} = \frac{(x+4)(x-4)}{x+4} = x - 4$$

The graph of $y = \frac{x^2 - 16}{x + 4}$ is the same as the graph of $y = x - 4$ except that there is a hole at $(-4, -8)$ because the rational function is not defined when $x = -4$.

Graph the rational function. Use an open circle for a point discontinuity.

44. $y = \frac{x^2 + 10x + 21}{x + 3}$ **45.** $y = \frac{x^2 - 36}{x - 6}$ **46.** $y = \frac{2x^2 - x - ?}{x + 2}$

Feb 8-1:28 PM

W.U.
Graph. List Stuff.

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

③ Simplify $\frac{3x^2}{8x} \cdot \frac{y}{6xy}$ ④ $\frac{3x^2-3x}{x^2+4x-5} \cdot \frac{x+x-20}{3x}$

$\frac{3x^5 y}{2 xy^4} = \boxed{\frac{3x^4}{2y^4}}$ ⑤ $\frac{7x}{2x-10} \div \frac{x^2-6x}{x^2-11x+30}$

W.O. $\frac{(x+1)}{(x+1)(x-1)} = \frac{1}{x-1}$ ④ $\frac{3x(x-1)}{(x+5)(x-1)} \cdot \frac{(x-5)(x-4)}{3x}$ $\boxed{x-4}$

W.O. $\frac{1}{(x+1)(x)} \neq 1$ ⑤ $\frac{7x}{2(x-5)} \cdot \frac{x^2-11x+30}{x^2-6x}$

$\frac{7x(x-5)(x-6)}{2(x-5)x(x-6)} = \boxed{\frac{7}{2}}$

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

W.O. $\frac{7x}{3x} = \frac{7}{3}$ W.O. $\frac{(x-7)}{(x-3)} \neq \frac{7}{3}$

May 4-11:18 AM

Extra Credit

LIST V.A. H.A. Domain d Range

① $y = \frac{2}{x+2} - 2$

② $y = \frac{3x-1}{6x+12}$

May 4-11:51 AM

8.5 Add and Subtract Rational Expressions   5/4

FOUNDATION -
Common Denominators to add/subtract fractions. LCM or LCD

① Find LCD 12   **NO HACK ZONE**
Ex 1 ② multiply each term by what's missing from LCD
③ combine numerator
④ leave denominator alone

Ex 2

① LCD = 12

$\frac{4}{4}\frac{1}{3} + \frac{1}{4}\frac{3}{3}$ $\frac{2}{2}\frac{1}{6} + \frac{1}{4}\frac{3}{3} =$
$\frac{4}{12} + \frac{3}{12} = \boxed{\frac{7}{12}}$ $\frac{2}{12} + \frac{3}{12} = \boxed{\frac{5}{12}}$

② Find Lcm:
$\frac{1}{6} + \frac{1}{4}$
 $2\cdot3$ $2\cdot2$
LCD: $2\cdot3\cdot2$
 $\boxed{12}$

Mar 17-12:16 PM

Find the LCM/LCD - ALL FACTORS OF EACH TERM MUST BE ACCOUNTED FOR.

Ex 1 $\frac{3}{7x}$ and $\frac{2}{4x^2}$

LCD
$7\cdot x\cdot 4\cdot x$
$\boxed{28x^2}$

1ˢᵗ List factors from 1ˢᵗ term denominator
2ⁿᵈ Check 2ⁿᵈ term denominator to see what's missing

3 $8x - 16$ and $12x^2 + 12x - 72$

Feb 9-9:10 AM

Perform the Operation.

Ex 1 $\frac{3}{7x} + \frac{2}{4x^2}$

LCD
$28x^2$

$\frac{4x}{4x}\cdot\frac{3}{7x} + \frac{2}{4x^2}\cdot\frac{7}{7} =$

$\frac{12x}{28x^2} + \frac{14}{28x^2} = \boxed{\frac{12x+14}{28x^2}}$

One ugly fraction

Ex 2 $\frac{3x}{5x^3} - \frac{6}{10x^2-15x}$

Feb 9-9:20 AM

Find LCD

Ex 2

$5x^3$ and $10x^2 - 15x$ Factor First.

$5x(2x-3)$

LCD

$$5x^3(2x-3)$$

May 4-12:22 PM

Perform the Operation

LCD $5x^3(2x-3)$

$$\frac{7}{5x^3} + \frac{(x-1)}{10x^2-15x}$$

$$\frac{(2x-3)}{(2x-3)}\frac{7}{5x^3} + \frac{(x-1)}{5x(2x-3)}\frac{x^2}{x^2}$$

$$\frac{14x-21}{5x^3(2x-3)} + \frac{x^3-x^2}{5x^3(2x-3)} =$$

distribute combine

$$\frac{x^3-x^2+14x-21}{5x^3(2x-3)}$$ ← leave factored

May 4-12:22 PM

Ex 3   factor first

$$\frac{x}{x^2-x-12} + \frac{5}{12x-48}$$
$$(x-4)(x+3) \qquad 12(x-4)$$

LCD $(x-4)(x+3)\,12$

$$\frac{12}{12(x-4)(x+3)}\cdot\frac{x}{} + \frac{5}{12(x-4)}\cdot\frac{(x+3)}{(x+3)}$$

$$\frac{12x}{12(x-4)(x+3)} + \frac{5x+15}{12(x-4)(x+3)}$$

$$\frac{17x+15}{12(x-4)(x+3)}$$

Ex 4 $\dfrac{1}{3x^2} + \dfrac{x}{9x^2-12x}$
$$\qquad\qquad 3x(3x-4)$$

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

$$\frac{(3x-4)}{(3x-4)}\cdot\frac{1}{3x^2} + \frac{x}{3x(3x-4)}\cdot\frac{x}{x}$$

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

Feb 9-9:24 AM

Ex 5   ex for #27 HW.

$$\frac{x+1}{x^2+4x+4} - \frac{6}{x^2-4}$$
$$(x+2)(x+2) \qquad (x+2)(x-2)$$

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

$$\frac{(x-2)}{(x-2)}\frac{(x+1)}{(x+2)(x+2)} - \frac{6}{(x+2)(x-2)}\frac{(x+2)}{(x+2)}$$

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

$$\frac{x^2-7x-14}{(x-2)(x+2)(x+2)}$$

Feb 9-9:27 AM

Perform the operation:

$$\frac{3}{x+4} - \frac{1}{x+6} =$$

First Find LCM

$(x+4)(x+6)$

Feb 9-8:46 AM

EXAMPLE 3   **Add with unlike denominators**

Add: $\dfrac{7}{9x^2} + \dfrac{x}{3x^2+3x}$

Solution

To find the LCD, factor each denominator and write each factor to the highest power it occurs. Note that $9x^2 = 3^2x^2$ and $3x^2+3x = 3x(x+1)$, so the LCD is $3^2x^2(x+1) = 9x^2(x+1)$.

$$\frac{7}{9x^2} + \frac{x}{3x^2+3x} = \frac{7}{9x^2} + \frac{x}{3x(x+1)}$$ **Factor second denominator.**

$$= \frac{7}{9x^2}\cdot\frac{x+1}{x+1} + \frac{x}{3x(x+1)}\cdot\frac{3x}{3x}$$ **LCD is $9x^2(x+1)$.**

$$= \frac{7x+7}{9x^2(x+1)} + \frac{3x^2}{9x^2(x+1)}$$ **Multiply.**

$$= \frac{3x^2+7x+7}{9x^2(x+1)}$$ **Add numerators.**

Jan 11-5:35 PM

EXAMPLE 4   **Subtract with unlike denominators**

Subtract: $\dfrac{x+2}{2x-2} - \dfrac{-2x-1}{x^2-4x+3}$

Solution

$\dfrac{x+2}{2x-2} - \dfrac{-2x-1}{x^2-4x+3}$

$= \dfrac{x+2}{2(x-1)} - \dfrac{-2x-1}{(x-1)(x-3)}$ **Factor denominators.**

$= \dfrac{x+2}{2(x-1)} \cdot \dfrac{x-3}{x-3} - \dfrac{-2x-1}{(x-1)(x-3)} \cdot \dfrac{2}{2}$ **LCD is $2(x-1)(x-3)$.**

$= \dfrac{x^2-x-6}{2(x-1)(x-3)} - \dfrac{-4x-2}{2(x-1)(x-3)}$ **Multiply.**

$= \dfrac{x^2-x-6-(-4x-2)}{2(x-1)(x-3)}$ **Subtract numerators.**

$= \dfrac{x^2+3x-4}{2(x-1)(x-3)}$ **Simplify numerator.**

$= \dfrac{(x-1)(x+4)}{2(x-1)(x-3)}$ **Factor numerator. Divide out common factor.**

$= \dfrac{x+4}{2(x-3)}$ **Simplify.**

Jan 11-5:35 PM