Warm Up

1) $y= \dfrac{5}{x} -1$

a) Domain: $\mathbb{R} \; x \neq 0$

x	y
-2	
-1	
0	

b) Range $\mathbb{R} \; y \neq -1$

c) Vertical Asymptote $x = 0$

d) Horizontal Asymptote $y = -1$
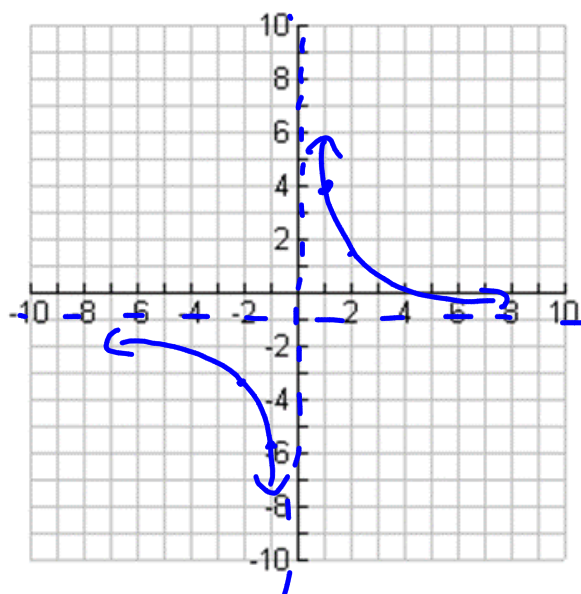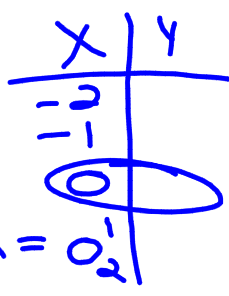
2) $y= \dfrac{4}{x+3} +1$

a) Domain: $\mathbb{R} \; x \neq -3$

x	y
-5	
-4	
-3	
-2	
-1	

b) Range: $\mathbb{R} \; y \neq 1$

c) Vertical Asymptote $x = -3$

d) Horizontal Asymptote $y = 1$

$\dfrac{4}{-3+3} + 1$

$\dfrac{4}{0}$
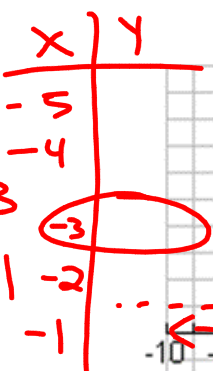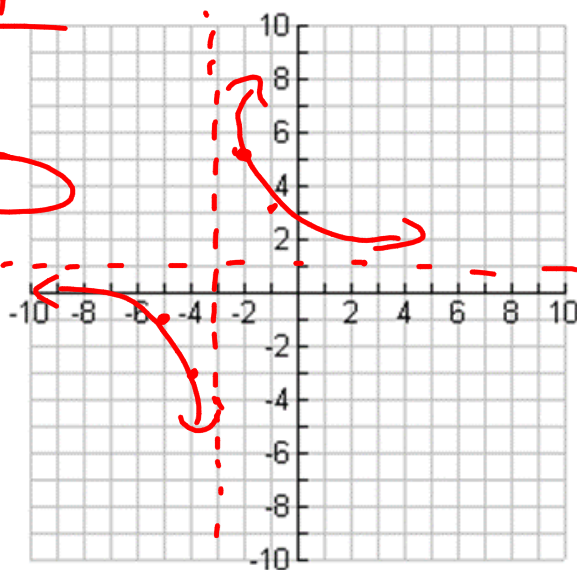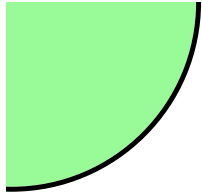
Review

Simplify:

1) x^3+2x^2+x

$x(x^2+2x+1)$

$x(x+1)(x+1)$

2) $\dfrac{2x^2y^4}{4xy^5}$

$\dfrac{1\ x}{2\ y}$

Differences of Squares

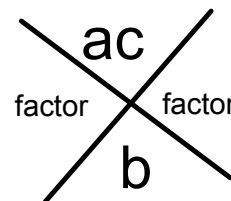Formula: $a^2 - b^2 = (a-b)(a+b)$

Ex 1: $x^2 - 49 = (x-7)(x+7)$

Ex 2: $4x^2 - 9y^8 = (2x - 3y^4)(2x + 3y^4)$

Ex 3: $12a^2 - 48 = 12(a^2 - 4) = 12(a-2)(a+2)$

Ex 4: $a^2 + 9 = $ PRIME! It's not a difference!

Ex 5: $-45x^2 + 20y^2z^2 = -5(9x^2 - 4y^2z^2) = -5(3x + 2yz)(3x - 2yz)$

Factoring WS

$$\begin{array}{c} \diagdown \text{ac} \diagup \\ \text{factor} \times \text{factor} \\ \diagup \text{b} \diagdown \end{array}$$

Ex: $3x^2 + 10x + 3$

$(3x^2 + 9x)(1x + 3)$
$3x(x+3) + 1(x+3)$
$(3x+1)(x+3)$

Sum and Difference of Cubes

$x^3 + 8 \quad (x+2)(x^2 - 2x + 4)$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

4. $x^3 + 64 = (x+4)(x^2 - 4x + 16)$

5. $27x^3 - 8 = (3x-2)(9x^2 + 6x + 4)$

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

$$2x(2x^2 - 1) = 0$$

$$2x = 0 \qquad 2x^2 - 1 = 0$$

$$x = 0$$

*Fun Factoring Review ws

$$2x^2 = 1$$

$$\sqrt{x^2} = \sqrt{\frac{1}{2}}$$ 10 minutes

$$x = \sqrt{\frac{1}{2}}$$
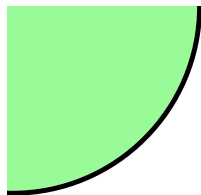
8.4 Simplifying Rational Functions

○ Is the rational function in its simplest form?

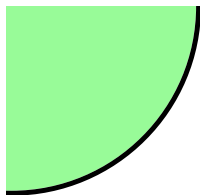○ What operations are possible in reducing to it simplest form?

8.4 Simplifying Rational Functions

* A rational expression is in ~~simplified form~~ if its numerator and denominator have no common factors.

Examples:　　　　　　　　$\dfrac{x^2 + 7x}{x^2}$　$\dfrac{x(x+7)}{x^2}$

$\dfrac{20}{85} = \dfrac{4}{17}$　　　　　　　　　　$\dfrac{x+7}{x}$

8.4 Simplifying Rational Functions

1) $\dfrac{2(x+1)}{(x+1)(x+3)} = \dfrac{2}{x+3}$

2) $\dfrac{x+4}{x^2-16}$ $\dfrac{x+4}{(x+4)(x-4)}$

$\dfrac{1}{x-4}$

15
15   1
16

3) $\dfrac{2x^2+10x}{3x^2+16x+5}$ $\dfrac{2x(x+5)}{(3x+1)(x+5)}$

$(3x^2+15x)(1x+5)$
$3x(x+5)+1(x+5)$

$= \boxed{\dfrac{2x}{3x+1}}$

TOYO

8.4 Simplifying Rational Functions

1) $\dfrac{40x+20}{10x+30}$

$\dfrac{2\cancel{0}\,(2x+1)}{1\cancel{0}\,(x+3)}$

$\boxed{\dfrac{2(2x+1)}{x+3}}$

2) $\dfrac{x^2-2x-3}{x^2-x-6}$

$\dfrac{\cancel{(x-3)}(x+1)}{\cancel{(x-3)}(x+2)}$

$\boxed{\dfrac{x+1}{x+2}}$

8.4 Simplifying Rational Functions

Multiply

Ex: $\dfrac{8x^3y}{2xy^2} \cdot \dfrac{7x^4y^3}{4y}$

$\dfrac{x^3y}{xy^2} \cdot \dfrac{7x^4y^3}{y}$

$\dfrac{7x^7y^4}{x^1y^3}$

$\boxed{7x^6y}$

KEY CONCEPT *For Your Notebook*

Multiplying Rational Expressions

The rule for multiplying rational expressions is the same as the rule for multiplying numerical fractions: multiply numerators, multiply denominators, and write the new fraction in simplified form.

Let a, b, c, and d be expressions with $b \neq 0$ and $d \neq 0$.

Property $\dfrac{a}{b} \cdot \dfrac{c}{d} = \dfrac{ac}{bd}$ Simplify $\dfrac{ac}{bd}$ if possible.

Example $\dfrac{5x^2}{2xy^2} \cdot \dfrac{6xy^3}{10y} = \dfrac{30x^3y^3}{20xy^3} = \dfrac{\cancel{10} \cdot 3 \cdot \cancel{x} \cdot x^2 \cdot \cancel{y^3}}{\cancel{10} \cdot 2 \cdot \cancel{x} \cdot \cancel{y^3}} = \dfrac{3x^2}{2}$

8.4 Simplifying Rational Functions

Multiply the expressions. Simplify the results:

1) $\dfrac{3x-3x^2}{x^2+4x-5} \cdot \dfrac{x^2+x-20}{3x}$

$\dfrac{3x(1-x)}{(x+5)(x-1)} \cdot \dfrac{(x+5)(x-4)}{3x}$

$$\dfrac{(1-x)(x-4)}{x-1}$$

2) $\dfrac{x+2}{x^3-27} \cdot \dfrac{(x^2+3x+9)}{1}$

$\dfrac{x+2}{(x-3)(x^2+3x+9)} \quad \dfrac{x^2+3x+9}{1}$

$$\dfrac{x+2}{x-3}$$

TOYO   8.4 Simplifying Rational Functions

Multiply the expressions. Simplify the results:

1) $\dfrac{2x^2-10x}{x^2-25} \circ \dfrac{x+3}{2x^2}$

$\dfrac{2x(x-5)}{(x+5)(x-5)} \cdot \dfrac{x+3}{2x^2 \; x}$

$\boxed{\dfrac{x+3}{x(x+5)}}$

2) $\dfrac{x+5}{x^3-1} \circ (x^2+x+1)$

$\dfrac{x+5}{(x-1)(x^2+x+1)} \cdot \dfrac{x^2+x+1}{}$

$\boxed{\dfrac{x+5}{x-1}}$

8.4 Simplifying Rational Functions

KEY CONCEPT   *For Your Notebook*

Dividing Rational Expressions

To divide one rational expression by another, multiply the first rational expression by the reciprocal of the second rational expression.

Let a, b, c, and d be expressions with $b \neq 0$, $c \neq 0$ and $d \neq 0$.

Property $\dfrac{a}{b} \div \dfrac{c}{d} = \dfrac{a}{b} \cdot \dfrac{d}{c} = \dfrac{ad}{bc}$ Simplify $\dfrac{ad}{bc}$ if possible.

Examples $\dfrac{2}{5} \div \dfrac{7}{3} = \dfrac{2}{5} \cdot \dfrac{3}{7} = \dfrac{6}{35}$

$\dfrac{7}{x+1} \div \dfrac{x+2}{2x-3} = \dfrac{7}{x+1} \cdot \dfrac{2x-3}{x+2} = \dfrac{7(2x-3)}{(x+1)(x+2)}$

8.4 Simplifying Rational Functions

Divide:

1) $\dfrac{7x}{2x-10} \div \dfrac{x^2-6x}{x^2-11x+30}$

$\dfrac{7x}{2x-10} \cdot \dfrac{x^2-11x+30}{x^2-6x}$

$\dfrac{7x}{2(x-5)} \cdot \dfrac{(x-6)(x-5)}{x(x-6)}$

$\boxed{\dfrac{7}{2}}$

2) $\dfrac{6x^2+x-15}{4x^2} \div (3x^2+5x)$

$\dfrac{6x^2+x-15}{4x^2} \cdot \dfrac{1}{3x^2+5x}$

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

$\boxed{\dfrac{2x-3}{4x^3}}$

TOYO   8.4 Simplifying Rational Functions

Divide:

1) $\dfrac{2x^2+3x-5}{6x} \div (2x^2+5x)$

$\dfrac{(2x+5)(x-1)}{6x} \cdot \dfrac{1}{x(2x+5)}$

$\boxed{\dfrac{x-1}{6x^2}}$

Exit Ticket

Perform the indicated operation and simplify.

1) $\dfrac{3x^2y^4z}{12x^4y^5z^4} \bullet \dfrac{8xy^3z}{6xyz^6}$

2) $\dfrac{3x+27}{6x-48} \div \dfrac{x^2+9x}{x^2-4x-32}$

HW: Page 577# 6-42 even(skip 22), 49

*Fun factoring ws