

January 9

Unit 5 Bare Necessities - Rational Expressions



Simplifying Rational Expressions

EX1. $\frac{x^2-16}{x^2+3x-28} = \frac{(x+4)(\cancel{x-4})}{(x+7)(\cancel{x-4})} = \boxed{\frac{x+4}{x+7}}$

x^2-16

$\sqrt{x^2} = x$

$\sqrt{16} = 4$

$(x+4)(x-4)$

$x^2+3x-28$

$x^2 \cdot -28 = -28x^2$

$7x + -4x = 3x$

$\frac{x^2+7x}{x} \mid \frac{-4x-28}{-4}$

$x(x+7) \mid -4(x+7)$

$(x+7)(x-4)$

Multiplying Rational Expressions

EX2. $\frac{x}{x+3} \cdot \frac{x^2-5x-24}{x^2-5x} = \frac{\cancel{x}}{\cancel{x+3}} \cdot \frac{(x-8)(\cancel{x+3})}{\cancel{x}(x-5)} = \boxed{\frac{x-8}{x-5}}$

x
doesn't
factor

$x+3$
doesn't
factor

$x^2-5x-24$

$x^2 \cdot -24 = -24x^2$

$-8x + 3x = -5x$

$\frac{x^2-5x}{x} \mid \frac{x}{x}$ GCF: x

$x(x-5)$

$\frac{x^2-8x}{x} \mid \frac{3x-24}{3}$

$x(x-8) \mid 3(x-8)$

$(x-8)(x+3)$

Dividing Rational Expressions

EX3. $\frac{x^2+9x+18}{x^2-9} \div \frac{x+6}{x-6}$

$$\frac{x^2+9x+18}{x^2-9} \cdot \frac{x-6}{x+6} = \frac{(x+6)(x+3)}{(x+3)(x-3)} \cdot \frac{(x-6)}{(x+6)} = \frac{x-6}{x-3}$$

$x^2+9x+18$
 $x^2 \cdot 18 = 18x^2$
 \wedge
 $6x + 3x = 9x$

$\frac{x^2+6x}{x} + \frac{3x+18}{3}$
 $x(x+6) \quad | \quad 3(x+6)$
 $(x+6)(x+3)$

x^2-9
 $\sqrt{x^2}=x$
 $\sqrt{9}=3$
 $(x+3)(x-3)$

$x-6$
doesn't factor

$x+6$
doesn't factor

Asymptotes and Holes of Rational Functions

EX4. $f(x) = \frac{2x^2-x-15}{x^2+x-12} = \frac{(x-3)(2x+5)}{(x+4)(x-3)}$

$x-3=0$
 $+3 \quad +3$
hole: $x=3$

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

$y = \frac{2x}{x^2}$

HA: $y=2$

EX5. $f(x) = \frac{x+7}{x^2-10x+21} = \frac{x+7}{(x-7)(x-3)}$

holes: none

$x-7=0$
 $+7 \quad +7$
VA: $x=7$

$x-3=0$
 $+3 \quad +3$
VA: $x=3$

$y = \frac{0x^2}{x^2}$

$y=0$