

## 7.1 Simplifying Rational Expressions

let  $u(x)$  and  $v(x)$  be polynomial functions, then  $f(x) = \frac{u(x)}{v(x)}$  is a rational function. The domain of  $f$  is the set of all numbers where  $v(x) \neq 0$ .

Ex: Find the domain of

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

$$x^2 + 5x - 6 = 0$$

$$\underline{(x+6)} \underline{(x-1)} = 0$$

$$x+6=0 \quad \text{or} \quad x-1=0$$

$-6 \quad -6 \qquad \qquad +1 \quad +1$

$\mathbb{R}$  except  $x = -6$   
or  
 $x \neq -6 \quad x \neq 1$

$$x = 1$$

To simplify, cancel any like terms. We get like terms by factoring.

1. GCF
2. special factoring formulas
3. guess & check

diff of squares  
sum of cubes  
diff. of cubes

Simplify:

$$\frac{2x^5 - 6x^2}{8x^4} = \frac{\cancel{2x^2}(x^3 - 3)}{\cancel{4}8x^4}$$
$$= \frac{x^3 - 3}{4x^2}$$

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

$$\text{Ex: } \frac{x^3 - 16x}{x^2 - 2x - 8} = \frac{x(x^2 - 16)}{(x-4)(x+2)}$$
$$= \frac{x(x+4)(\cancel{x-4})}{(\cancel{x-4})(x+2)}$$
$$= \frac{x(x+4)}{x+2}$$

$$\text{Ex: } \frac{x^2 - 1}{1 - x} = \frac{(x-1)(x+1)}{1-x} \quad \text{opposites factor -1}$$
$$= \frac{\cancel{(x-1)}(x+1)}{-1(\cancel{-1+x})}$$
$$= \frac{(x+1)}{-1}$$
$$= -(x+1)$$

p. 435  
2-58 even, skip 54