

8.1

## Evaluating Rational Expressions

② Find  $\frac{3x^2-2x}{4x+7}$  for  $x=-2$

$$\frac{3(-2)^2-2(-2)}{4(-2)+7} = \frac{3(4)+4}{-8+7} = \frac{12+4}{-1} = \frac{16}{-1} = -16$$

Be careful of dividing by zero.

③ find  $\frac{x^2+3}{2x-4}$  for  $x=2$  and  $x=0$

$$\text{for } x=2 \quad \frac{2^2+3}{2 \cdot 2-4} = \frac{4+3}{4-4} = \frac{7}{0} = ? \leftarrow \text{undefined!}$$

$$\text{for } x=0 \quad \frac{0^2+3}{2 \cdot 0-4} = \frac{3}{-4} = -\frac{3}{4}$$

notice that  $\frac{x^2+3}{2x-4}$  is undefined at  $x=2$  but IS defined everywhere else!

④ find all values for which  $\frac{2x+3}{x^2+3x+2}$  is undefined!

$$x^2+3x+2 \neq 0$$

$$(x+2)(x+1) \neq 0$$

$x \neq -1$  and  $x \neq -2$  undefined at  $-1, -2$ .

Rational Expression - like a  
Fraction w/ expressions

### Simplifying Rational Expressions

ex.  $\frac{x+2}{x}$  or  $\frac{xy^2+4y}{x+1}$

We simplify rational expressions just like  
we simplify fractions.

ex. In  $\frac{6}{15} = \frac{2 \cdot 3}{3 \cdot 5} = \frac{2}{5}$

so in  $\frac{6x}{15x} = \frac{2 \cdot 3 \cdot x}{3 \cdot 5 \cdot x} = \frac{2}{5}$

ex.  $\frac{8x^2y^2}{16xy^5} = \frac{1x}{2y^3}$

Sometimes more complicated

ex.  $\frac{x^2+4x+4}{3x^2+6x} = \frac{(x+2)(x+2)}{3x(x+2)} = \frac{x+2}{3x}$

Division by 1.

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

Factor numerator & denominator

ex.  $\frac{x^2+6x+8}{x^2+3x-4} = \frac{(x+4)(x+2)}{(x-1)(x+4)} = \frac{x+2}{x-1}$

ex.  $\frac{x(x-3)-4(x-1)+6}{x(x+3)-5(x+3)} = \frac{x^2-3x-4x+4+6}{x^2+3x-5x-15} = \frac{x^2-7x+10}{x^2-2x-15}$   
 $= \frac{(x-2)(x-5)}{(x+3)(x-5)} = \frac{x-2}{x+3}$

~~Dividing Polynomials That Are Negatives~~

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

(ex)  $\frac{x^2-x-12}{-x-3} = \frac{(x+3)(x-4)}{-(x+3)} = \frac{x-4}{-1} = -(x-4) = -x+4$

~~General Approach~~ (to simplifying Rational Exp)

1. factor the numerator
2. factor the denominator
3. Cancel any common factors