Factor Completely

a) $2x^2 + 11x + 12$

b) $y^2 - 3y - 40$

c) $a^2 - 18ac + 45c^2$

Solve the compound inequality

d) $x - 1 \leq 7x - 1$ and $4x - 7 < 3 - x$

e) $\{3, 5, 7\} \cup \{4, 6, 9\}$

Express the solution set at least two ways.

Solve the equation, inequality

f) $2\,|u + 6\,| = 10$

g) $|2(x - 1) + 4| \leq 8$

Chapter 6 section 1

- Rational Expressions and Functions: Multiplying and Dividing

Rational Expressions

- Examples:

- $$\frac{120x}{100-x}$$

- $$\frac{2x+7}{1-x^2}$$

- $$\frac{2x}{14xy}$$

- Polynomial divided by a nonzero polynomial

Rational Functions

- Function defined by a formula that is a rational expression

- f(x) = $\dfrac{2}{x+4}$

Domain of a Rational Function

$$f(x) = \frac{4}{x-2}$$

- Set of all real numbers except those that make the denominator zero.
- Why ?

Domain of the Rational Function

What values are excluded from the function's domain that causes the division by zero?

- $f(x) = \dfrac{2}{x+4}$

The value x = - 4 is excluded

Domain if f = $\left\{-\infty, -4\right\} \cup \left\{-4, \infty\right\}$

Find the domain

1) $f(x) = \dfrac{2x+1}{2x^2 - x - 1}$

Hint: Factor

Simplify Rational Expressions

- Expression is simplified if its numerator and denominator have no common factors other that 1or -1

Simplifying Rational Expressions

1. Factor the numerator and the denominator completely.
2. Divide both the numerator and the denominator by any common factors.

Simplify

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

Solution:

a) Factor the numerator and denominator
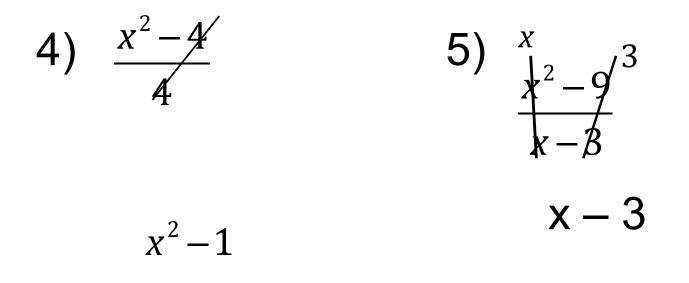
- $$\frac{(x+1)(x+3)}{1(x+1)}$$

b) Reduce

$x + 3$ and state the restrictions, x ≠ -1

Simplify

2) $\dfrac{4x+20}{x^2+5x}$

3) $\dfrac{x^2+3xy-10y^2}{3x^2-7xy+2y^2}$

Explain why the following are incorrect

4) $\dfrac{x^2 - \cancel{4}}{\cancel{4}}$

$x^2 - 1$

Reduce the 4

5) $\dfrac{x \quad \cancel{x^2 - 9}^{3}}{x - \cancel{3}}$

$x - 3$

Reduce the x and
3 goes into 9, 3 times

Define division as multiplication

- Define division problems as multiplication then solve multiplication problems.

Multiplying and Dividing

- Find the quotient of two rational expressions by taking the **reciprocal** of the divisor and multiply.

$$\frac{x}{7} \div \frac{6}{y}$$

$$\frac{x}{7} \cdot \frac{y}{6}$$

$$\frac{xy}{42}$$

Change to multiplication

6) $\dfrac{7}{y-5} \div \dfrac{28}{3y-15}$

7) $\dfrac{y^2+y}{y^2-4} \div \dfrac{y^2-1}{y^2+5y+6}$

Multiply Rational Expressions

Multiplying Rational Expressions

1. Factor all numerators and denominators completely.
2. Divide numerators and denominators by common factors.
3. Multiply the remaining factors in the numerators and multiply the remaining factors in the denominators.

- $$\frac{x+3}{x-4} \cdot \frac{x^2-2x-8}{x^2-9}$$

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

Multiply

- Multiply the numerators
- Multiply the denominators

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

- Reduce

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

Now

Complete problems 6 and 7.

Change to multiplication and divide

6) $\dfrac{7}{y-5} \div \dfrac{28}{3y-15}$

7) $\dfrac{y^2+y}{y^2-4} \div \dfrac{y^2-1}{y^2+5y+6}$

Summary

- Reduce Rational Expression by factoring.

- Change the division of rational expression to multiplication.

- Multiply rational expressions by factoring.