Unit 1 (7.1)

Rational Expressions

1. Which of the following are rational numbers, and which are not?

$\frac{3}{4},\ 3.14,\ \pi,\ \frac{5}{0},\ -\sqrt{17},\ 23,\ \frac{1+\sqrt{5}}{2},\ -1, 6.022 \times 10^{23}, 0, 4\text{i}$

Rational Numbers
Not rational

Definition of rational:

Steps for simplifying:

What are restrictions?

How do we find them?

Examples: Find an equivalent rational expression in lowest terms (don't forget to state restrictions).

1. $\frac{16n}{20n}$

2. $\frac{(x+3)(x-2)}{(x-2)(2x+5)}$

3. $\frac{(3+x)(6x-7)}{(x+3)(6x+7)}$

4. $\frac{4x-2}{6-12x}$

5. $\frac{5x^2+13x-6}{x^2-9x-36}$

6. $\frac{x^2-16}{3x^2+10x-8}$

Rule for multiplying rational expressions:

If a, b, c, and d are integers with $c \neq 0$ and $d \neq 0$, then

$$\frac{a}{c} \cdot \frac{b}{d} = \frac{ab}{cd}$$

Steps for multiplying:

Examples:

a. $\left(\frac{3x-6}{2x+6}\right) \cdot \left(\frac{5x+15}{6x+12}\right)$

b. $\frac{x^2+3x-28}{8x-72} \cdot \frac{x^2-16x+63}{x^2-49}$

You try:

Find the following products and reduce to lowest terms, state restrictions:

1. $\left(\frac{\mathbf{2x+6}}{\mathbf{x^2+x-6}}\right) \cdot \left(\frac{\mathbf{x^2-4}}{\mathbf{2x}}\right)$

2. $\left(\frac{\mathbf{x^2-3x}}{\mathbf{x^2-10x+21}}\right) \cdot \left(\frac{\mathbf{x^2-12x+35}}{\mathbf{5x^2-25x}}\right)$

How do we divide fractions - rational expressions :

Recall that division is the same as multiplying by the inverse.

Ex. $15 \div \frac{1}{3}$ is the same as $15 * 3 = 45$

Ex2. $\frac{3}{5} \div \frac{6}{7}$ is the same as $\frac{3}{5} * \frac{7}{6} = \frac{21}{30} = \frac{7}{10}$

Rule for dividing rational expressions:

If a, b, c, and d are integers with $b \neq 0$, $c \neq 0$, and $d \neq 0$, then

$$\frac{a}{c} \div \frac{b}{d} = \frac{a}{c} \cdot \frac{d}{b}.$$

Examples:

a. $\frac{x-3}{x^2-7x+6} \div \frac{x^2-x-6}{x-1}$

b. $\frac{x^2-2x-24}{x^2-4} \div \frac{x^2+3x-4}{x^2+x-2}$

Steps for dividing:

You try:

Find the following quotients and reduce to lowest terms, state restrictions:

1. $\left(\frac{16x-24}{4x^2-9}\right) \div \left(\frac{12x+36}{x^2-8x-33}\right)$

2. $\frac{\left(\frac{x^2-15x+54}{25x^2-4}\right)}{\left(\frac{x^2-81}{5x^2-2x}\right)}$

Review and Preview:

1. $\frac{x^2-16}{5x^2+16x-16}$

2. $\frac{x^2+6x-16}{x^2+3x-40} * \frac{x^2+6x-55}{x^2+9x-22}$

3. $\frac{18x-108}{x^2+9x+8} \div \frac{36x^2-36x}{x^2-1}$

4. $\frac{x^2+9x-80}{x^2-36} - \frac{3x-8}{x^2-36}$