Notes:

Factor.
1. $2x^2 - 3x + 1$ 2. $4x^2 - 9$ 3. $5x^2 + 6x + 1$

$(2x - 1)(x - 1)$ $(2x - 3)(2x + 3)$ $(5x + 1)(x + 1)$

Rational Expression – the quotient of two polynomials.

Simplest Form – the numerator and denominator of a rational expression have no common factor

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Examples:

1. What is $\dfrac{x^2 - 6x - 16}{x^2 + 5x + 6}$ in simplest form? State restrictions on the variable.

$$\frac{x^2-6x-16}{x^2+5x+6}=\frac{(x+2)(x-8)}{x^2+5x+6}=\frac{(x+2)(x-8)}{(x+2)(x+3)}=\frac{x-8}{x+3}$$

x≠-3,-2

2. What is the product $\dfrac{x^2-25}{x^2+4x+3}\cdot\dfrac{x^2+x-6}{x-5}$ in simplest form? State any restrictions on the variable.

$$\frac{x^2-25}{x^2+4x+3}\cdot\frac{x^2+x-6}{x-5}=\frac{(x^2-25)(x^2+x-6)}{(x^2+4x+3)(x-5)}=\frac{(x+3)(x-2)(x^2-25)}{(x-5)(x^2+4x+3)}$$

$$=\frac{(x+3)(x-2)(x^2-25)}{(x-5)(x+1)(x+3)}=\frac{(x-2)(x^2-25)}{(x-5)(x+1)}=\frac{(x+5)(x-5)(x-2)}{(x-5)(x+1)}$$

$$=\frac{(x+5)(x-2)}{x+1}$$

x≠-3,-1,-5

3. What is the quotient $\dfrac{x^2+5x+4}{x^2+x-12} \div \dfrac{x^2-1}{2x^2-6x}$ in simplest form? State any restrictions on the variable.

$$\left(\frac{\left(x^2+5x+4\right)}{\left(x^2+x-12\right)}\right) \div \left(\frac{\left(x^2-1\right)}{\left(2x^2-6\right)}\right) = \frac{\left(x^2+5x+4\right)\left(2x^2-6x\right)}{\left(x^2+x-12\right)\left(x^2-1\right)} = \frac{2x\left(x-3\right)\left(x+1\right)\left(x+4\right)}{\left(x^2-1\right)\left(x^2+x-12\right)}$$

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

$X \neq -4, -1, 1, 3$

4. Find the product in simplest form of:

$$\frac{\left(2x^2+7x-15\right)}{\left(4x^2-8x+3\right)} \cdot \frac{\left(2x^2+x-1\right)}{\left(x^2+6x+5\right)}$$

$$\frac{\left(2x^2+7x-15\right)}{\left(4x^2-8x+3\right)} \cdot \frac{\left(2x^2+x-1\right)}{\left(x^2+6x+5\right)} = \frac{\left(x+5\right)\left(2x-3\right)}{\left(2x-1\right)\left(2x-3\right)} \cdot \frac{\left(x+1\right)\left(2x-1\right)}{\left(x+1\right)\left(x+5\right)}$$

$$= \frac{x+5}{2x-1} \cdot \frac{2x-1}{x+5} = \frac{\left(x+5\right)\left(2x-1\right)}{\left(2x-1\right)\left(x+5\right)} = \frac{2x-1}{2x-1} = 1$$

5. Find the quotient in simplest form of:

$$\frac{\left(12x^2-22x+8\right)}{\left(3x\right)} \div \frac{\left(3x^2+2x-8\right)}{\left(2x^2+4x\right)}$$

$$\frac{\left(12x^2-22x+8\right)}{\left(3x\right)} \div \frac{\left(3x^2+2x-8\right)}{\left(2x^2+4x\right)} = \frac{\left(12x^2-22x+8\right)\left(2x^2+4x\right)}{3x\left(3x^2+2x-8\right)}$$

$$= \frac{4x\left(x+2\right)\left(6x^2-11x+4\right)}{3x\left(3x^2+2x-8\right)} = \frac{4\left(6x^2-11x+4\right)\left(x+2\right)}{3\left(3x^2+2x-8\right)} = \frac{4\left(x+2\right)\left(2x-1\right)\left(3x-4\right)}{3\left(3x^2+2x-8\right)}$$

$$= \frac{4\left(x+2\right)\left(2x-1\right)\left(3x-4\right)}{3\left(x+2\right)\left(3x-4\right)} = \frac{4\left(2x-1\right)}{3}$$