

Exam Review Part 2a - Rational Expressions

MCR3U

ensen

SOLUTIONS

Section 1: Simplifying Rational Expressions

1) Simplify each expression. State all restrictions on x .

$$\frac{2x}{1x} \times \frac{5}{-3}$$

$$\frac{2x}{1x} \times \frac{3}{-3}$$

a) $\frac{x-7}{x^2-4x-21}$

b) $\frac{2x^2+7x-15}{2x^2+3x-9}$

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

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

$$= \frac{1}{x+3}; x \neq 7, -3$$

$$= \frac{x+5}{x+3}; x \neq -3, \frac{3}{2}$$

2) Simplify and state any restrictions.

a) $\frac{36x^4}{5x^2} \times \frac{80x^3}{12x}$

b) $\frac{3x}{32y} \div \frac{27x^2}{96y}$

$$= \frac{48x^7}{x^3}$$

$$= \frac{1}{32y} \times \frac{396y}{27x^2}$$

$$= 48x^4; x \neq 0$$

$$= \frac{3xy}{9x^2y}$$

$$= \frac{1}{3x}; x \neq 0, y \neq 0$$

3) Simplify and state any restrictions

a) $\frac{x^4}{x^6} \times \frac{x-6}{x}$

b) $\frac{x-8}{x+2} \times \frac{x+2}{x-6}$

$$= 4; x \neq 6$$

$$= \frac{x-8}{x-6}; x \neq -2, 6$$

c) $\frac{4x-20}{x^2+6x} \times \frac{3x^2}{3x-15}$

d) $\frac{x^2+3x+2}{x^2-1} \times \frac{x-1}{x^2-2x-8}$

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

$$= \frac{(x+2)(\cancel{x+1})}{(x+1)(\cancel{x-1})} \times \frac{\cancel{x-1}}{(x-4)(\cancel{x+2})}$$

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

$$= \frac{1}{x-4}; x \neq -2, -1, 1, 4$$

$$= \frac{4x}{x+6}; x \neq -6, 0, 5$$

4) Simplify and state any restrictions

$$\begin{aligned} \text{a) } \frac{x+1}{x} \div \frac{x+1}{2x} \\ = \frac{\cancel{x+1}}{x} \times \frac{2x}{\cancel{x+1}} \\ = 2; x \neq -1, 0 \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{x+12}{x+10} \div \frac{x+12}{x-5} \\ = \frac{\cancel{x+12}}{x+10} \times \frac{x-5}{\cancel{x+12}} \\ = \frac{x-5}{x+10}; x \neq -12, -10, 5 \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{6x}{8x-72} \div \frac{9x}{2x-18} \\ = \frac{6x}{8(x-9)} \times \frac{2(\cancel{x+9})}{9x} \\ = \frac{12x}{72x} \\ = \frac{1}{6}; x \neq 0, 9 \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{x^2-7x+10}{x^2-4} \div \frac{x^2-4x-5}{3x+6} \\ = \frac{(x-2)(x-5)}{(x-2)(x+2)} \times \frac{3(\cancel{x+2})}{(x-5)(x+1)} \\ = \frac{3}{x+1}; x \neq -2, -1, 2, 5 \end{aligned}$$

5) Simplify and state any restrictions.

$$\begin{aligned} \text{a) } \frac{5}{7x} - \frac{3}{4x} \\ = \frac{20}{28x} - \frac{21}{28x} \\ = \frac{-1}{28x}; x \neq 0 \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{4}{ab} + \frac{9}{2b} \\ = \frac{8}{2ab} + \frac{9a}{2ab} \\ = \frac{8+9a}{2ab}; a \neq 0, b \neq 0 \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{2}{x-3} - \frac{5}{x+3} \\ = \frac{2(x+3) - 5(x-3)}{(x-3)(x+3)} \\ = \frac{2x+6-5x+15}{(x-3)(x+3)} \\ = \frac{-3x+21}{(x-3)(x+3)} \\ = \frac{-3(x-7)}{(x-3)(x+3)}; x \neq -3, 3 \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{7}{x+4} + \frac{11}{x-5} \\ = \frac{7(x-5) + 11(x+4)}{(x+4)(x-5)} \\ = \frac{7x-35+11x+44}{(x+4)(x-5)} \\ = \frac{18x+9}{(x+4)(x-5)} \\ = \frac{9(2x+1)}{(x+4)(x-5)}; x \neq -4, 5 \end{aligned}$$

6) Simplify and state any restrictions

$$\begin{aligned} \text{a) } & \frac{4x}{x^2-9x+18} + \frac{2x-1}{x-6} \\ & = \frac{4x}{(x-3)(x-6)} + \frac{2x-1}{x-6} \cdot \frac{(x-3)}{(x-3)} \\ & = \frac{4x + 2x^2 - 6x - x + 3}{(x-3)(x-6)} \\ & = \frac{2x^2 - 3x + 3}{(x-3)(x-6)} ; x \neq 3, 6 \end{aligned}$$

$$\begin{aligned} \text{b) } & \frac{2x}{x-2} - \frac{3}{x^2-4} \\ & = \frac{2x}{x-2} - \frac{3}{(x-2)(x+2)} \\ & = \frac{2x^2 + 4x - 3}{(x-2)(x+2)} ; x \neq -2, 2 \end{aligned}$$

$$\begin{aligned} \text{c) } & \frac{3x+9}{x^2+5x+6} - \frac{2x-2}{x^2+x-2} \\ & = \frac{3(x+3)}{(x+2)(x+3)} - \frac{2(x-1)}{(x+2)(x-1)} \\ & = \frac{3}{x+2} - \frac{2}{x+2} \\ & = \frac{1}{x+2} ; x \neq -3, -2, 1 \end{aligned}$$

$$\begin{aligned} \text{d) } & \frac{4x^2-20x}{x^2+2x-35} + \frac{3x-6}{x^2-12x+20} \\ & = \frac{4x(x-5)}{(x+7)(x-5)} + \frac{3(x-2)}{(x-10)(x-2)} \\ & = \frac{4x}{(x+7)(x-5)} + \frac{3}{(x-10)(x+7)} \\ & = \frac{4x^2 - 40x + 3x + 21}{(x-10)(x+7)} \\ & = \frac{4x^2 - 37x + 21}{(x-10)(x+7)} ; x \neq -7, 10 \end{aligned}$$

7) Simplify and state the restrictions.

$$\begin{aligned} \text{a) } & \frac{1}{x-5} - \frac{1}{5-x} \\ & = \frac{1}{x-5} + \frac{1}{x-5} \\ & = \frac{2}{x-5} ; x \neq 5 \end{aligned}$$

$$\begin{aligned} \text{b) } & \frac{3x+2}{3-4x} + \frac{2x+1}{4x-3} \\ & = \frac{3x+2}{3-4x} - \frac{2x+1}{3-4x} \\ & = \frac{3x+2-2x-1}{3-4x} \\ & = \frac{x+1}{3-4x} ; x \neq \frac{3}{4} \end{aligned}$$

Answers

1) a) $\frac{1}{x+3}; x \neq -3, 7$ b) $\frac{x+5}{x+3}; x \neq -3, \frac{3}{2}$

2) a) $48x^4; x \neq 0$ b) $\frac{1}{3x}; x \neq 0, y \neq 0$

3) a) $4; x \neq 6$ b) $\frac{x-8}{x-6}; x \neq -2, 6$ c) $\frac{4x}{x+6}; x \neq -6, 0, 5$ d) $\frac{1}{x-4}; x \neq -2, -1, 1, 4$

4) a) $2; x \neq -1, 0$ b) $\frac{x-5}{x+10}; x \neq -12, -10, 5$ c) $\frac{1}{6}; x \neq 0, 9$ d) $\frac{3}{x+1}; x \neq -2, -1, 2, 5$

5) a) $-\frac{1}{28x}; x \neq 0$ b) $\frac{8+9a}{2ab}; a \neq 0, b \neq 0$ c) $\frac{-3(x-7)}{(x-3)(x+3)}; x \neq -3, 3$ d) $\frac{9(2x+1)}{(x+4)(x-5)}; x \neq -4, 5$

6) a) $\frac{2x^2-3x+3}{(x-6)(x-3)}; x \neq 3, 6$ b) $\frac{2x^2+4x-3}{(x-2)(x+2)}; x \neq -2, 2$ c) $\frac{1}{x+2}; x \neq -3, -2, 1$ d) $\frac{4x^2-37x+21}{(x+7)(x-10)}; x \neq -7, 2, 5, 10$

7) a) $\frac{2}{x-5}; x \neq 5$ b) $\frac{-x-1}{4x-3}; x \neq \frac{3}{4}$

OR

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