

Simplify completely:

$$\begin{array}{r} -12 \\ 12 \cancel{-} -1 \\ \hline 11 \end{array}$$

$$1.) \frac{x+4}{3x^2+11x-4} = \frac{x+4}{(3x^2+12x)-(x-4)} = \frac{x+4}{3x(x+4)-1(x-4)} = \frac{x+4}{(3x-1)(x+4)} = \frac{1}{3x-1}$$

$x \neq \frac{1}{3}, -4$

$$\begin{array}{r} -12 \\ 4 \cancel{-} -3 \\ \hline 1 \end{array}$$

$$2.) \frac{3x-9}{x^2+x-12} = \frac{3(x-3)}{(x+4)(x-3)} = \frac{3}{x+4}$$

$x \neq -4, 3$

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

$x \neq 1, -3$

$$4.) \left(\frac{x^2-16}{x^2-4x+4}\right) \left(\frac{x-2}{x^2+6x+8}\right) = \frac{(x+4)(x-4)}{(x-2)(x-2)} \cdot \frac{x-2}{(x+4)(x+2)} = \frac{x-4}{(x-2)(x+2)}$$

$x \neq 2, -4, -2$

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$$5.) \frac{\frac{x-2}{x-1}}{\frac{x^2-4}{x^2+x-2}} = \frac{x-2}{x-1} \cdot \frac{x^2+x-2}{x^2-4} = \frac{x-2}{x-1} \cdot \frac{(x+2)(x-1)}{(x+2)(x-2)} = 1$$

$$6.) \frac{\frac{x}{3} + \frac{x}{4}}{x^2-3x} \div \frac{6x-12}{x^2+3x} = \frac{\frac{x}{3} + \frac{x}{4}}{\frac{x^2-3x}{2(x-2)}} \cdot \frac{2(x-2)}{10(x-2)}$$

$$= \frac{(4x-3)(x) + x(3x-6)}{2x^2+6x} = \frac{4x^2-8x+3x^2-6x}{2x^2+6x} = \frac{7x^2-14x}{2x^2+6x}$$

$$= \frac{7x(x-2)}{2x(x+3)} = \frac{7(x-2)}{2(x+3)}$$

Add or subtract as indicated:

$$7.) \frac{x-5}{3x+4} - \frac{3x-5}{3x+4} = \frac{x-5-3x+5}{3x+4} = \frac{-2x}{3x+4}$$

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

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

$$9.) \frac{x}{x-3} + \frac{2}{x^2-9} = \frac{x}{(x+3)(x-3)} + \frac{2}{(x+3)(x-3)} = \frac{x^2+3x}{(x+3)(x-3)} + \frac{2}{(x+3)(x-3)}$$

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

$$10.) \frac{2}{(x-2)x+3} + \frac{5}{x-2} \cdot \frac{(x+3)}{(x+3)}$$

$$\frac{2x-4}{(x-2)(x+3)} + \frac{5x+15}{(x-2)(x+3)} = \frac{7x+11}{(x-2)(x+3)}$$

State the values for x which make the expression undefined.

$$11.) \frac{x-2}{x^2-16} \div \frac{x-1}{x+7} \quad x \neq -4, 4, 1, -7$$

$$\frac{x-2}{x^2-16} \cdot \frac{x+7}{x-1} = \frac{x-2}{(x+4)(x-4)} \cdot \frac{x+7}{x-1}$$

$$12.) \text{ Find the LCM of } x^2+2x+1 \text{ and } x^2-4x-5$$

$$(x+1)(x+1) \quad (x-5)(x+1)$$

$$\text{LCM: } (x+1)(x+1)(x-5)$$