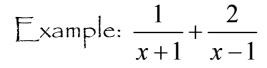
3. Addition and Subtraction



Factor wherever possible.

To add fractions, we need a common denominator. When they don't have a common factor, the common denominator will be the product of the two

denominators. Common denominator:
$$(x+1)(x-1)$$

$$\left(\frac{x-1}{x-1}\right)\left(\frac{1}{x+1}\right) + \left(\frac{2}{x-1}\right)\left(\frac{x+1}{x+1}\right), \quad \chi \neq \{-1, 1\}$$

Multiply, then add the fractions; be sure to state any restrictions.

$$\frac{x-1}{(x-1)(x+1)} \underbrace{2x+2}_{(x-1)(x+1)}$$

$$\frac{3x+1}{(x-1)(x+1)} \quad \text{or} \quad \frac{3x+1}{x^2-1} \qquad x \neq \{-1,1\}$$

Example:
$$\frac{x+3}{x-5} - \frac{x-1}{x+7}$$

$$\begin{array}{c|c} \hline \chi_{+7} & \chi_{+3} \\ \hline \chi_{+7} & \chi_{-5} \\ \hline \end{array} - \begin{array}{c|c} \hline \chi_{-} & \chi_{-5} \\ \hline \chi_{+7} & \chi_{-5} \\ \hline \end{array}$$

$$\chi \neq \{7,5\}$$
3: State restrictions
$$\frac{(\chi^2 + 10\chi + 2)}{(\chi^2 + 5)} = \frac{(\chi^2 - 6\chi + 5)}{(\chi^2 + 5)}$$
4: Do the 2 multiplications, then subtract the numerator

$$\frac{10x + 16}{(x+7)(x-5)}$$

$$\frac{16(x+16)}{(x+2x-3)}$$

1: Factor None

2: Common denominator no common factor ⇒ cd is their product (x-s)(x+7)

3: State restrictions

then subtract the numerators; be sure to subtract each term of the second numerator!

Example:
$$\frac{a-b}{a^2-1} + \frac{b-1}{a-1}$$

Factor wherever possible.

$$\frac{a-b}{(a+1)(a-1)} + \frac{b-1}{a-1} \left(\right)$$

Since there is a common factor in each denominator, we need to multiply one by the factor that will make both look the same. (a+1)(a-1) (common denominator

$$\frac{a-b}{(a+1)(a-1)} + \frac{b-1(a+1)}{a-1(a+1)} \qquad a \neq \{-1, 1\}$$

State any restrictions.

Multiply, then add the numerators.

$$\frac{ab + b - a - 1}{(a+1)(a-1)}$$

$$\frac{ab-1}{(a+1)(a-1)}$$
 or $\frac{ab-1}{a^2-1}$ $a \neq \{-1,1\}$

Example:
$$\frac{x}{x^2-9} - \frac{1}{2x-6}$$
 Factor wherever possible.

$$\frac{x}{(x+3)(x-3)} - \frac{1}{2(x-3)}$$
 Make the denominators

The same of the same.

Denominators have a common factor

$$\frac{2}{2} \underbrace{\frac{x}{(x+3)(x-3)}}_{2} - \underbrace{\frac{1}{2(x-3)}}_{2} \underbrace{\frac{x+3}{x+3}}_{2}, \quad \chi \neq \left\{-3, 3\right\}$$

$$\frac{2x}{2(x+3)(x-3)} - \underbrace{\frac{(x+3)}{2(x-3)(x+3)}}_{2}$$

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

$$=\frac{1}{2(x+3)} \quad x \neq \{-3,3\}$$

Example:
$$\frac{x+1}{x^2-2x+1} - \frac{1}{x-1}$$

$$\frac{x+1}{(x-1)(x-1)} - \frac{1}{x-1}$$

$$\frac{x+1}{(x-1)(x-1)} - \frac{1}{x-1}$$

$$\frac{x+1}{(x-1)(x-1)} - \frac{1}{x-1} \left(\frac{x-1}{x-1} \right)$$

$$\frac{x+1}{(x-1)(x-1)} (x-1)(x-1), x \neq 1$$

$$= \frac{2}{(x-1)(x-1)} \quad \text{or} \quad \frac{2}{x^2 - 2x + 1}, \quad x \neq 1$$