

Adding and Subtracting Rational Expressions

Simplify each expression.

$$1. \frac{4 \cdot 5}{4 \cdot 6ab} - \frac{7 \cdot 3b}{8a \cdot 3b}$$

$$\frac{20 - 21b}{24ab}$$

$$2. 3x - 5 - \frac{(x+4)(x+4)}{(x-8)(x+4)}$$

$$\frac{3x^2 + 12x - 5x - 20 - x + 8}{x+4} = \frac{3x^2 + 6x - 12}{x+4}$$

or $\frac{3(x^2 + 2x - 4)}{x+4}$

$$3. \frac{4(a-5)}{a-3} + \frac{9(a-3)}{a-5}$$

$$\frac{4a - 20 + 9a - 27}{(a-3)(a-5)} = \frac{13a - 47}{(a-3)(a-5)}$$

$$4. \frac{16}{x^2 - 16} + \frac{2(x-4)}{x+4(x-4)}$$

$$\frac{16 + 2x - 8}{x^2 - 16} = \frac{2x + 8}{x^2 - 16} = \frac{2(x+4)}{(x+4)(x-4)} = \frac{2}{x-4}; x \neq 4$$

$$5. \frac{5}{2x-12} - \frac{20}{x^2-4x-12} = \frac{5(x+2)}{2(x-6)} - \frac{20 \cdot 2}{(x-6)(x+2)}$$

$$6. \frac{2-5m}{m-9} + \frac{4m-5}{9-m} = \frac{2-5m}{m-9} - \frac{4m-5}{m-9}$$

$$\frac{5x+10-40}{2(x-6)(x+2)} = \frac{5x-30}{2(x-6)(x+2)} = \frac{5(x-6)}{2(x-6)(x+2)} = \frac{5}{2(x+2)}; x \neq -6$$

$$= \frac{2-5m-4m+5}{m-9} = \frac{-9m+7}{m-9} \text{ or } \frac{7-9m}{m-9}$$

$$7. \frac{2p-3}{p^2-5p+6} - \frac{5}{p^2-9} = \frac{(2p-3)(p+3)}{(p-3)(p-2)} - \frac{5(p-2)}{(p-3)(p+3)}$$

$$8. \frac{1}{5n} - \frac{3}{4} + \frac{7}{10n} = \frac{4}{20n} - \frac{15n}{20n} + \frac{14}{20n}$$

$$\frac{2p^2+3p-9-5p+10}{(p-3)(p-2)(p+3)} = \frac{2p^2-2p+1}{(p-3)(p-2)(p+3)}$$

$$= \frac{18-15n}{20n}$$

$$9. \frac{\frac{r+6}{r} - \frac{1}{r+2}}{\frac{r^2+4r+3}{r^2+r}} = \left[\frac{(r+6)(r+2)}{r} - \frac{1}{r+2} \right] \div \left[\frac{r^2+4r+3}{r^2+r} \right]$$

$$10. \frac{\frac{n+5}{n+1} - \frac{12}{n+1}}{\frac{n+9}{n+1} - \frac{5}{n}} = \left[\frac{n^2+n+5n+5-12}{n+1} \right] \div \left[\frac{n^2+9n-5n-5}{n(n+1)} \right]$$

$$\left[\frac{r^2+7r+12}{r(r+2)} \right] \cdot \left[\frac{r}{r+3} \right]$$

$$\left[\frac{n^2+6n-7}{n+1} \right] \div \left[\frac{n^2+4n-5}{n(n+1)} \right]$$

$$\left[\frac{(r+3)(r+4)}{r(r+2)} \right] \cdot \frac{r}{r+3}$$

$$\left[\frac{(n+7)(n-1)}{(n+1)} \right] \cdot \left[\frac{n(n+1)}{(n+5)(n-1)} \right]$$

$$\frac{n(n+7)}{(n+5)}; n \neq 0, \pm 1$$

$$11. \frac{\frac{2(x+4)}{x-y} + \frac{1}{x+y}}{\frac{1}{x-y}} = \frac{r+4}{r+2}; r \neq -1, 0, -3$$

$$12. \frac{\frac{x-5x}{x+2}}{\frac{x-3}{x}} = \left[\frac{x^2+2x-5x}{x+2} \right] \div \left[\frac{x-3}{x} \right]$$

$$\left[\frac{2x+2y+x-y}{(x-y)(x+y)} \right] \div \left[\frac{1}{x-y} \right]$$

$$\left[\frac{3x-y}{(x+y)(x-y)} \right] \cdot \left[\frac{x-y}{1} \right] = \frac{3x-y}{x+y}; x \neq y$$

$$\frac{x^2-3x}{x+2} \cdot \frac{x}{x-3}$$

$$\frac{x(x-3)}{x+2} \cdot \frac{x}{x-3} = \frac{x^2}{x+2}; x \neq 3$$