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1.2 Algebraic fractions

1a] $(x+3) \times \frac{1}{(x+3)(x-3)} \Rightarrow \frac{1}{x+3}$

b] $\frac{(x+1)(x-1)}{3} \times \frac{1}{(x+1)(x+1)} \Rightarrow \frac{x-1}{3(x+1)}$

c] $\frac{x(x+5)}{y-2} \times \frac{y(y-2)}{x^2} \Rightarrow \frac{y(x+5)}{x}$

2a] $\frac{x}{x+2} \div \frac{x^3}{x^2+x-2}$

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

b] $\frac{9x^2-16}{5x-10} \div \frac{3x-4}{10}$

$\Rightarrow \frac{(3x+4)(3x-4)}{5(x-2)} \times \frac{10^2}{3x-4} \Rightarrow \frac{2(3x+4)}{x-2}$

c] $\frac{2x^2+3xy-2y^2}{5xy} \div \frac{x^2+2xy}{10x^2}$

$\Rightarrow \frac{(2y+x)(2x-y)}{5xy} \times \frac{10^2 x^2}{x(x+2y)} \Rightarrow \frac{2(2x-y)}{y}$

3a] $\frac{5}{x+3} + \frac{2}{x-1} \Rightarrow \frac{5(x-1)+2(x+3)}{(x+3)(x-1)}$

$\Rightarrow \frac{5x-5+2x+6}{(x+3)(x-1)} \Rightarrow \frac{7x+1}{(x+3)(x-1)}$

1.2 Algebraic fractions

3b] $\frac{4}{2(x-3)} + \frac{5}{3(x+1)} \Rightarrow \frac{2}{(x-3)} + \frac{5}{3(x+1)}$

$\Rightarrow \frac{6(x+1) + 5(x-3)}{3(x-3)(x+1)} \Rightarrow \frac{11x-9}{3(x-3)(x+1)}$

c] $\frac{2x}{x-5} - \frac{3x}{x+5} \Rightarrow \frac{2x(x+5) - 3x(x-5)}{(x+5)(x-5)}$

$= \frac{2x^2+10x-3x^2+15x}{(x+5)(x-5)} \Rightarrow \frac{25x-x^2}{(x+5)(x-5)}$

$\Rightarrow \frac{x(25-x)}{(x+5)(x-5)}$

d] $\frac{x+1}{2x-3} - \frac{2x}{x+2} \Rightarrow \frac{x+1(x+2) - 2x(2x-3)}{(2x-3)(x+2)}$

$\Rightarrow \frac{x^2+2x+x+2-4x^2+6x}{(2x-3)(x+2)}$

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

4a] $\frac{5x}{4x^2-9} + \frac{3}{2x-3} \Rightarrow \frac{5x}{(2x-3)(2x+3)} + \frac{3}{2x-3}$

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

$\Rightarrow \frac{5x+6x+9}{(2x-3)(2x+3)} \Rightarrow \frac{11x+9}{(2x+3)(2x-3)}$

b] $\frac{2}{x^2+x-12} + \frac{1}{x^2-5x+6}$

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

1.2 Algebraic Fractions

4b] Cont.

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

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

c] $\dfrac{5}{4x^2+4x+1} - \dfrac{3}{4x^2-1}$

$$\Rightarrow \frac{5}{(2x+1)(2x+1)} - \frac{3}{(2x-1)(2x+1)}$$

$$\Rightarrow \frac{5(2x-1)-3(2x+1)}{(2x+1)(2x-1)}$$

$$\Rightarrow \frac{10x-5-6x-3}{(2x+1)(2x-1)} \Rightarrow \frac{4x-8}{(2x+1)^2(2x-1)}$$

$$\Rightarrow \frac{4(x-2)}{(2x+1)^2(2x-1)}$$

d] $\dfrac{x-1}{x^2+3x+2} - \dfrac{x-2}{x^2-2x-3}$

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

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

$$\Rightarrow \frac{x^2-3x-x+3-(x^2-4)}{(x+1)(x+2)(x-3)}$$

$$\Rightarrow \frac{-4x+7}{(x+1)(x+2)(x-3)}$$

1.2 Algebraic Fractions

5] $\frac{x^2+4x+4}{y^2-6y+9} \div \frac{x^2-4}{y^2-9}$

$\Rightarrow \frac{x^2+4x+4}{y^2-6y+9} \times \frac{y^2-9}{x^2-4}$

$\Rightarrow \frac{(x+2)^2}{(y-3)^2} \times \frac{(y-3)(y+3)}{(x-2)(x+2)}$

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

6] $\frac{x^2-2x-15}{2x^2-12} \times \frac{x^3-6x^2}{x^2-5x-24}$

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

$\Rightarrow \frac{x(x-5)(x-6)}{2(x^2-6)(x-8)}$

7] $\frac{2x^2-5x}{25x^2-1} + \frac{3x}{5x-1}$

$\Rightarrow \frac{x(2x-5)}{(5x-1)(5x+1)} + \frac{3x}{5x-1}$

$\Rightarrow \frac{x(2x-5)+3x(5x+1)}{(5x-1)(5x+1)}$

$\Rightarrow \frac{2x^2-5x+15x^2+3x}{(5x-1)(5x+1)}$

$\Rightarrow \frac{17x^2-2x}{(5x-1)(5x+1)}$

1.2 Algebraic Fractions

8] $\frac{3x-2}{2x^2-5x-3} - \frac{5}{2x+1}$

$\Rightarrow \frac{3x-2}{(x-3)(2x+1)} - \frac{5}{2x+1}$

$\Rightarrow \frac{3x-2-(5)(x-3)}{(2x+1)(x-3)}$

$\Rightarrow \frac{3x-2-5x+15}{(2x+1)(x-3)}$

$\Rightarrow \frac{-2x+13}{(2x+1)(x-3)}$

9a] $f(x) = x + \frac{5}{x+3} + \frac{40}{x^2-2x-15}$

$\Rightarrow x + \frac{5}{x+3} + \frac{40}{(x-5)(x+3)}$

$\Rightarrow \frac{x(x-5)(x+3) + 5(x-5) + 40}{(x+3)(x-5)(x+3)}$

$\Rightarrow \frac{x(x^2+3x-5x-15) + 5x - 25 + 40}{(x+3)(x-5)}$

$\Rightarrow \frac{x^3 - 2x^2 - 10x + 15}{(x+3)(x-5)}$

1.2 Algebraic Fractions

9b]

$$x+3 \;\overline{)\; x^3 - 2x^2 - 10x + 15}$$

$$x^2 - 5x + 5$$

$x^3 + 3x^2$

$-5x^2 - 10x + 15$

$-5x^2 - 15x$

$5x + 15$

$5x + 15$

0

$$\therefore f(x) = \frac{x^2 - 5x + 5}{x - 5}$$