

Exercise 6B

$$\begin{aligned} 1. \quad (\text{a}) \quad \frac{7}{6a} + \frac{4}{9a} &= \frac{63}{54a} + \frac{24}{54a} \\ &= \frac{63 + 24}{54a} \\ &= \frac{87}{54a} \\ &= \frac{29}{18a} \end{aligned}$$

$$\begin{aligned} (\text{b}) \quad \frac{3}{2b} + \frac{1}{3b} - \frac{5}{6b} &= \frac{9}{6b} + \frac{2}{6b} - \frac{5}{6b} \\ &= \frac{9 + 2 - 5}{6b} \\ &= \frac{6}{6b} \\ &= \frac{1}{b} \end{aligned}$$

$$\begin{aligned} (\text{c}) \quad \frac{1}{3c} - \frac{1}{3d} &= \frac{d}{3cd} - \frac{c}{3cd} \\ &= \frac{d - c}{3cd} \end{aligned}$$

$$\begin{aligned} (\text{d}) \quad \frac{f - 4h}{3k} - \frac{2f - 5h}{8k} &= \frac{8(f - 4h)}{24k} - \frac{3(2f - 5h)}{24k} \\ &= \frac{8f - 32h - 6f + 15h}{24k} \\ &= \frac{2f - 17h}{24k} \end{aligned}$$

$$\begin{aligned} (\text{e}) \quad \frac{4a}{x - 3y} + \frac{3a}{3x - 9y} &= \frac{12a}{3x - 9y} + \frac{3a}{3x - 9y} \\ &= \frac{12a + 3a}{3x - 9y} \\ &= \frac{15a}{3x - 9y} \\ &= \frac{15a}{3(x - 3y)} \\ &= \frac{5a}{x - 3y} \end{aligned}$$

Q#1

$$\begin{aligned} \text{(f)} \quad \frac{p+3}{2z} + \frac{p-1}{6z} - \frac{2p+1}{3z} &= \frac{3(p+3)}{6z} + \frac{p-1}{6z} - \frac{2(2p+1)}{6z} \\ &= \frac{3(p+3) + (p-1) - 2(2p+1)}{6z} \\ &= \frac{3p+9+p-1-4p-2}{6z} \\ &= \frac{6}{6z} \\ &= \frac{1}{z} \end{aligned}$$

$$\begin{aligned} \text{2. (a)} \quad \frac{5}{a} + \frac{3}{a+4} &= \frac{5(a+4)}{a(a+4)} + \frac{3a}{a(a+4)} \\ &= \frac{5(a+4) + 3a}{a(a+4)} \\ &= \frac{5a+20+3a}{a(a+4)} \\ &= \frac{8a+20}{a(a+4)} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{1}{2b} - \frac{3}{b+c} &= \frac{b+c}{2b(b+c)} - \frac{3(2b)}{2b(b+c)} \\ &= \frac{b+c-3(2b)}{2b(b+c)} \\ &= \frac{b+c-6b}{2b(b+c)} \\ &= \frac{c-5b}{2b(b+c)} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{4}{d-5} + \frac{2}{2d+3} &= \frac{4(2d+3)}{(d-5)(2d+3)} + \frac{2(d-5)}{(d-5)(2d+3)} \\ &= \frac{4(2d+3) + 2(d-5)}{(d-5)(2d+3)} \\ &= \frac{8d+12+2d-10}{(d-5)(2d+3)} \\ &= \frac{10d+2}{(d-5)(2d+3)} \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad \frac{2}{f+5} - \frac{3}{f-1} &= \frac{2(f-1)}{(f+5)(f-1)} - \frac{3(f+5)}{(f+5)(f-1)} \\ &= \frac{2(f-1) - 3(f+5)}{(f+5)(f-1)} \\ &= \frac{2f-2-3f-15}{(f+5)(f-1)} \\ &= \frac{-f-17}{(f+5)(f-1)} \end{aligned}$$

$$\begin{aligned} \text{(e)} \quad \frac{11}{3h-7} + \frac{2}{6-5h} &= \frac{11(6-5h)}{(3h-7)(6-5h)} + \frac{2(3h-7)}{(3h-7)(6-5h)} \\ &= \frac{11(6-5h) + 2(3h-7)}{(3h-7)(6-5h)} \\ &= \frac{66-55h+6h-14}{(3h-7)(6-5h)} \\ &= \frac{52-49h}{(3h-7)(6-5h)} \end{aligned}$$

Q#2

$$\begin{aligned} \text{(f)} \quad \frac{3}{k^2 - 1} + \frac{2}{k - 1} &= \frac{3}{(k + 1)(k - 1)} + \frac{2}{k - 1} \\ &= \frac{3}{(k + 1)(k - 1)} + \frac{2(k + 1)}{(k + 1)(k - 1)} \\ &= \frac{3 + 2(k + 1)}{(k + 1)(k - 1)} \\ &= \frac{3 + 2k + 2}{(k + 1)(k - 1)} \\ &= \frac{2k + 5}{(k + 1)(k - 1)} \end{aligned}$$

$$\begin{aligned} \text{(g)} \quad \frac{3}{4m^2 - 1} - \frac{5}{2m + 1} &= \frac{3}{(2m + 1)(2m - 1)} - \frac{5}{2m + 1} \\ &= \frac{3}{(2m + 1)(2m - 1)} - \frac{5(2m - 1)}{(2m + 1)(2m - 1)} \\ &= \frac{3 - 5(2m - 1)}{(2m + 1)(2m - 1)} \\ &= \frac{3 - 10m + 5}{(2m + 1)(2m - 1)} \\ &= \frac{8 - 10m}{(2m + 1)(2m - 1)} \end{aligned}$$

$$\begin{aligned} \text{(h)} \quad \frac{2}{n - 2} + \frac{3}{(n - 2)^2} &= \frac{2(n - 2)}{(n - 2)^2} + \frac{3}{(n - 2)^2} \\ &= \frac{2(n - 2) + 3}{(n - 2)^2} \\ &= \frac{2n - 4 + 3}{(n - 2)^2} \\ &= \frac{2n - 1}{(n - 2)^2} \end{aligned}$$

$$\begin{aligned} \text{3. (a)} \quad \frac{5}{2(a - b)} + \frac{4}{3(b - a)} &= \frac{5}{2(a - b)} + \frac{4}{-3(a - b)} \\ &= \frac{5}{2(a - b)} - \frac{4}{3(a - b)} \\ &= \frac{15}{6(a - b)} - \frac{8}{6(a - b)} \\ &= \frac{15 - 8}{6(a - b)} \\ &= \frac{7}{6(a - b)} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{c - 1}{3c - 7} - \frac{1}{14 - 6c} &= \frac{c - 1}{3c - 7} - \frac{1}{-2(3c - 7)} \\ &= \frac{c - 1}{3c - 7} + \frac{1}{2(3c - 7)} \\ &= \frac{2(c - 1)}{2(3c - 7)} + \frac{1}{2(3c - 7)} \\ &= \frac{2(c - 1) + 1}{2(3c - 7)} \\ &= \frac{2c - 2 + 1}{2(3c - 7)} \\ &= \frac{2c - 1}{2(3c - 7)} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{4f}{10f - 5d} + \frac{2d}{6f - 3d} &= \frac{4f}{5(2f - d)} + \frac{2d}{3(2f - d)} \\ &= \frac{12f}{15(2f - d)} + \frac{10d}{15(2f - d)} \\ &= \frac{12f + 10d}{15(2f - d)} \end{aligned}$$

Q#3

$$\begin{aligned} \text{(d)} \quad \frac{u+1}{2u-8} - \frac{u+2}{12-3u} &= \frac{u+1}{2(u-4)} - \frac{u+2}{-3(u-4)} \\ &= \frac{u+1}{2(u-4)} + \frac{u+2}{3(u-4)} \\ &= \frac{3(u+1)}{6(u-4)} + \frac{2(u+2)}{6(u-4)} \\ &= \frac{3(u+1)+2(u+2)}{6(u-4)} \\ &= \frac{3u+3+2u+4}{6(u-4)} \\ &= \frac{5u+7}{6(u-4)} \end{aligned}$$

$$\begin{aligned} \text{(e)} \quad \frac{2m-5}{9n-6} - \frac{m+3}{4-6n} &= \frac{2m-5}{3(3n-2)} - \frac{m+3}{-2(3n-2)} \\ &= \frac{2m-5}{3(3n-2)} + \frac{m+3}{2(3n-2)} \\ &= \frac{2(2m-5)}{6(3n-2)} + \frac{3(m+3)}{6(3n-2)} \\ &= \frac{2(2m-5)+3(m+3)}{6(3n-2)} \\ &= \frac{4m-10+3m+9}{6(3n-2)} \\ &= \frac{7m-1}{6(3n-2)} \end{aligned}$$

$$\begin{aligned} \text{(f)} \quad \frac{h+k}{p-q} + \frac{3h+k}{8q-8p} &= \frac{h+k}{p-q} + \frac{3h+k}{-8(p-q)} \\ &= \frac{h+k}{p-q} - \frac{3h+k}{8(p-q)} \\ &= \frac{8(h+k)}{8(p-q)} - \frac{3h+k}{8(p-q)} \\ &= \frac{8(h+k)-(3h+k)}{8(p-q)} \\ &= \frac{8h+8k-3h-k}{8(p-q)} \\ &= \frac{5h+7k}{8(p-q)} \end{aligned}$$

$$\begin{aligned} \text{(g)} \quad \frac{5x^2}{6x-6y} - \frac{2x^2}{3y-3x} &= \frac{5x^2}{6(x-y)} - \frac{2x^2}{-3(x-y)} \\ &= \frac{5x^2}{6(x-y)} + \frac{2x^2}{3(x-y)} \\ &= \frac{5x^2}{6(x-y)} + \frac{4x^2}{6(x-y)} \\ &= \frac{5x^2+4x^2}{6(x-y)} \\ &= \frac{9x^2}{6(x-y)} \\ &= \frac{3x^2}{2(x-y)} \end{aligned}$$

$$\begin{aligned} \text{(h)} \quad \frac{3x}{4y-2z} - \frac{2x}{z-2y} + \frac{5}{3z-6y} \\ &= \frac{3x}{-2(z-2y)} - \frac{2x}{z-2y} + \frac{5}{3(z-2y)} \\ &= -\frac{3x}{2(z-2y)} - \frac{2x}{z-2y} + \frac{5}{3(z-2y)} \\ &= -\frac{9x}{6(z-2y)} - \frac{12x}{6(z-2y)} + \frac{10}{6(z-2y)} \\ &= \frac{-9x-12x+10}{6(z-2y)} \\ &= \frac{10-21x}{6(z-2y)} \end{aligned}$$

$$\begin{aligned}
 4. \quad (a) \quad \frac{3a}{3a-5} + \frac{4a}{4a-1} &= \frac{3a(4a-1)}{(3a-5)(4a-1)} + \frac{4a(3a-5)}{(3a-5)(4a-1)} \\
 &= \frac{3a(4a-1) + 4a(3a-5)}{(3a-5)(4a-1)} \\
 &= \frac{12a^2 - 3a + 12a^2 - 20a}{(3a-5)(4a-1)} \\
 &= \frac{24a^2 - 23a}{(3a-5)(4a-1)}
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \frac{5}{2b+1} - \frac{2b}{(2b+1)^2} &= \frac{5(2b+1)}{(2b+1)^2} - \frac{2b}{(2b+1)^2} \\
 &= \frac{5(2b+1) - 2b}{(2b+1)^2} \\
 &= \frac{10b + 5 - 2b}{(2b+1)^2} \\
 &= \frac{8b + 5}{(2b+1)^2}
 \end{aligned}$$

$$\begin{aligned}
 (c) \quad \frac{h+5}{h^2-6h} - \frac{3}{h-6} &= \frac{h+5}{h(h-6)} - \frac{3}{h-6} \\
 &= \frac{h+5}{h(h-6)} - \frac{3h}{h(h-6)} \\
 &= \frac{h+5-3h}{h(h-6)} \\
 &= \frac{5-2h}{h(h-6)}
 \end{aligned}$$

$$\begin{aligned}
 (d) \quad \frac{1}{m} + \frac{2}{m-4} + \frac{3}{m-3} \\
 &= \frac{(m-4)(m-3)}{m(m-4)(m-3)} + \frac{2m(m-3)}{m(m-4)(m-3)} + \frac{3m(m-4)}{m(m-4)(m-3)} \\
 &= \frac{(m-4)(m-3) + 2m(m-3) + 3m(m-4)}{m(m-4)(m-3)} \\
 &= \frac{m^2 - 3m - 4m + 12 + 2m^2 - 6m + 3m^2 - 12m}{m(m-4)(m-3)} \\
 &= \frac{6m^2 - 25m + 12}{m(m-4)(m-3)}
 \end{aligned}$$

Q#4

$$\begin{aligned}
 \text{(e)} \quad & \frac{x+y}{x-y} + \frac{x^2-4y^2}{x^2-y^2} - \frac{x-3y}{x+y} \\
 &= \frac{x+y}{x-y} + \frac{x^2-4y^2}{(x+y)(x-y)} - \frac{x-3y}{x+y} \\
 &= \frac{(x+y)(x+y)}{(x+y)(x-y)} + \frac{x^2-4y^2}{(x+y)(x-y)} - \frac{(x-3y)(x-y)}{(x+y)(x-y)} \\
 &= \frac{(x+y)(x+y) + x^2 - 4y^2 - (x-3y)(x-y)}{(x+y)(x-y)} \\
 &= \frac{x^2 + xy + xy + y^2 + x^2 - 4y^2 - (x^2 - xy - 3xy + 3y^2)}{(x+y)(x-y)} \\
 &= \frac{x^2 + xy + xy + y^2 + x^2 - 4y^2 - x^2 + 4xy - 3y^2}{(x+y)(x-y)} \\
 &= \frac{x^2 + 6xy - 6y^2}{(x+y)(x-y)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(f)} \quad & \frac{1}{2z-3} - \frac{2}{3-2z} + \frac{18}{9-4z^2} \\
 &= \frac{1}{2z-3} - \frac{2}{-(2z-3)} + \frac{18}{-(2z+3)(2z-3)} \\
 &= \frac{1}{2z-3} + \frac{2}{2z-3} - \frac{18}{(2z+3)(2z-3)} \\
 &= \frac{1+2}{2z-3} - \frac{18}{(2z+3)(2z-3)} \\
 &= \frac{3(2z+3)}{(2z+3)(2z-3)} - \frac{18}{(2z+3)(2z-3)} \\
 &= \frac{3(2z+3) - 18}{(2z+3)(2z-3)} \\
 &= \frac{6z+9-18}{(2z+3)(2z-3)} \\
 &= \frac{6z-9}{(2z+3)(2z-3)} \\
 &= \frac{3(2z-3)}{(2z+3)(2z-3)} \\
 &= \frac{3}{2z+3}
 \end{aligned}$$

$$\begin{aligned}
 \text{5. (a)} \quad & \frac{2}{a+3} + \frac{3}{a^2+4a+3} = \frac{2}{a+3} + \frac{3}{(a+3)(a+1)} \\
 &= \frac{2(a+1)}{(a+3)(a+1)} + \frac{3}{(a+3)(a+1)} \\
 &= \frac{2(a+1)+3}{(a+3)(a+1)} \\
 &= \frac{2a+2+3}{(a+3)(a+1)} \\
 &= \frac{2a+5}{(a+3)(a+1)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & \frac{1}{b^2-5b-6} - \frac{b}{b-6} = \frac{1}{(b+1)(b-6)} - \frac{b}{b-6} \\
 &= \frac{1}{(b+1)(b-6)} - \frac{b(b+1)}{(b+1)(b-6)} \\
 &= \frac{1-b(b+1)}{(b+1)(b-6)} \\
 &= \frac{1-b^2-b}{(b+1)(b-6)} \\
 &= \frac{-b^2-b+1}{(b+1)(b-6)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & \frac{1}{2p^2-8p-10} + \frac{2p}{p-5} \\
 &= \frac{1}{2(p+1)(p-5)} + \frac{2p}{p-5} \\
 &= \frac{1}{2(p+1)(p-5)} + \frac{2p[2(p+1)]}{2(p+1)(p-5)} \\
 &= \frac{1+2p[2(p+1)]}{2(p+1)(p-5)} \\
 &= \frac{1+2p(2p+2)}{2(p+1)(p-5)} \\
 &= \frac{1+4p^2+4p}{2(p+1)(p-5)} \\
 &= \frac{4p^2+4p+1}{2(p+1)(p-5)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & \frac{x}{x+y} + \frac{4}{x^2+3xy+2y^2} - \frac{3x}{x+2y} \\
 &= \frac{x}{x+y} + \frac{4}{(x+y)(x+2y)} - \frac{3x}{x+2y} \\
 &= \frac{x(x+2y)}{(x+y)(x+2y)} + \frac{4}{(x+y)(x+2y)} - \frac{3x(x+y)}{(x+y)(x+2y)} \\
 &= \frac{x(x+2y)+4-3x(x+y)}{(x+y)(x+2y)} \\
 &= \frac{x^2+2xy+4-3x^2-3xy}{(x+y)(x+2y)} \\
 &= \frac{-2x^2-xy+4}{(x+y)(x+2y)}
 \end{aligned}$$

$$\begin{aligned}
 \text{6.} \quad & \frac{1}{3x} + \frac{2}{y} = \frac{y}{3xy} + \frac{6x}{3xy} \\
 & \frac{2}{x} = \frac{2}{x} \\
 &= \frac{y+6x}{3xy} \\
 &= \frac{2}{x} \\
 &= \frac{y+6x}{3xy} \div \frac{2}{x} \\
 &= \frac{y+6x}{3xy} \times \frac{x}{2} \\
 &= \frac{y+6x}{6y}
 \end{aligned}$$