

## Chapter 13 Exercise 13.1

$$\begin{aligned}
 \text{Q. 1. } & \frac{2x+1}{3} + \frac{3x-1}{2} \\
 &= \frac{2(2x+1)}{6} + \frac{3(3x-1)}{6} \\
 &= \frac{4x+2}{6} + \frac{9x-3}{6} \\
 &= \frac{4x+2+9x-3}{6} \\
 &= \frac{13x-1}{6}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 2. } & \frac{5p-3}{2} - \frac{p+2}{5} \\
 &= \frac{5(5p-3) - 2(p+2)}{10} \\
 &= \frac{25p-15}{10} + \frac{-2p-4}{10} \\
 &= \frac{25p-15-2p-4}{10} \\
 &= \frac{23p-19}{10}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 3. } & \frac{y-4}{4} - \frac{2y-5}{3} \\
 &= \frac{3(y-4) - 4(2y-5)}{12} \\
 &= \frac{3y-12-8y+20}{12} \\
 &= \frac{-5y+8}{12}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 4. } & \frac{3y-1}{3} + \frac{y-1}{5} + \frac{1}{1} \\
 &= \frac{15y-5+3y-3+15}{15} \\
 &= \frac{18y+7}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 5. } & \frac{2x+1}{7} - 2 + \frac{x+2}{14} \\
 &= \frac{2x+1}{7} - \frac{2}{1} + \frac{x+2}{14} \\
 &= \frac{2(2x+1) - 14(2) + 1(x+2)}{14} \\
 &= \frac{4x+2-28+x+2}{14} \\
 &= \frac{5x-24}{14}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 6. } & \frac{1}{12} + \frac{4q-2}{3} - \frac{7q-2}{6} \\
 &= \frac{1}{12} + \frac{4(4q-2)}{12} - \frac{2(7q-2)}{12} \\
 &= \frac{1+4(4q-2)-2(7q-2)}{12} \\
 &= \frac{1+16q-8-14q+4}{12} \\
 &= \frac{-3+2q}{12} \\
 &= \frac{2q-3}{12}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 7. } & \frac{5x-1}{5} - \frac{x-4}{3} + \frac{7}{15} \\
 &= \frac{3(5x-1)}{15} - \frac{5(x-4)}{15} + \frac{7}{15} \\
 &= \frac{15x-3-5x+20+7}{15} \\
 &= \frac{10x+24}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 8. } & r - 3 - \frac{4r+3}{5} - \frac{5r}{3} \\
 &= \frac{r}{1} - \frac{3}{1} - \frac{4r+3}{5} - \frac{5r}{3} \\
 &= \frac{15r}{15} - \frac{15(3)}{15} - \frac{3(4r+3)}{15} - \frac{5(5r)}{15} \\
 &= \frac{15r-45-12r-9-25r}{15} \\
 &= \frac{-22r-54}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 9. } & \frac{2x-9}{10} - \frac{2-x}{2} - x \\
 &= \frac{2x-9}{10} - \frac{(2-x)}{2} - \frac{x}{1} \\
 &= \frac{2x-9-5(2-x)-10 \cdot x}{10} \\
 &= \frac{2x-9-10+5x-10x}{10} \\
 &= \frac{-3x-19}{10}
 \end{aligned}$$

$$\begin{aligned}
 \text{Q. 10. } & \frac{1}{5x} + \frac{3}{2x} = \frac{2 \cdot 1}{10x} + \frac{5 \cdot 3}{10x} \\
 &= \frac{2}{10x} + \frac{15}{10x} \\
 &= \frac{17}{10x}
 \end{aligned}$$

$$\begin{aligned} \text{Q. 11. } \frac{1}{3x} - \frac{2}{6x} &= \frac{2 \cdot 1}{6x} - \frac{2}{6x} \\ &= \frac{2}{6x} - \frac{2}{6x} \\ &= \frac{2-2}{6x} \\ &= \frac{0}{6x} = 0 \end{aligned}$$

$$\begin{aligned} \text{Q. 12. } \frac{8}{x+1} - \frac{1}{x} &= \frac{8 \cdot x - 1 \cdot (x+1)}{(x+1) \cdot x} \\ &= \frac{8x - x - 1}{(x+1)x} \\ &= \frac{7x - 1}{(x+1)x} \end{aligned}$$

$$\begin{aligned} \text{Q. 13. } \frac{3}{x+4} - \frac{2}{x} &= \frac{3 \cdot x - 2(x+4)}{(x+4) \cdot x} \\ &= \frac{3x - 2x - 8}{(x+4)x} \\ &= \frac{x - 8}{(x+4)x} \end{aligned}$$

$$\begin{aligned} \text{Q. 14. } \frac{5}{2x-1} + \frac{2}{3x-1} \\ &= \frac{5(3x-1) + 2(2x-1)}{(2x-1)(3x-1)} \\ &= \frac{19x - 7}{(2x-1)(3x-1)} \end{aligned}$$

$$\begin{aligned} \text{Q. 15 } \frac{1}{x+5} - \frac{3}{4x-2} \\ &= \frac{1(4x-2)}{(x+5)(4x-2)} - \frac{3(x+5)}{(x+5)(4x-2)} \\ &= \frac{4x-2-3x-15}{(x+5)(4x-2)} \\ &= \frac{x-17}{(x+5)(4x-2)} \end{aligned}$$

$$\begin{aligned} \text{Q. 16. } \frac{1}{5x+1} + \frac{2}{7-x} \\ &= \frac{1(7-x) + 2(5x+1)}{(5x+1)(7-x)} \\ &= \frac{7-x+10x+2}{(5x+1)(7-x)} \\ &= \frac{9x+9}{(5x+1)(7-x)} \end{aligned}$$

$$\begin{aligned} \text{Q. 17. } \frac{3}{2x-1} - \frac{5}{4x-3} \\ &= \frac{3(4x-3) - 5(2x-1)}{(2x-1)(4x-3)} \\ &= \frac{12x-9-10x+5}{(2x-1)(4x-3)} \\ &= \frac{2x-4}{(2x-1)(4x-3)} \end{aligned}$$

$$\begin{aligned} \text{Q. 18. } \frac{6}{5-x} + \frac{2}{x+2} &= \frac{6(x+2) + 2(5-x)}{(5-x)(x+2)} \\ &= \frac{6x+12+10-2x}{(5-x)(x+2)} \\ &= \frac{4x+22}{(5-x)(x+2)} \end{aligned}$$

$$\begin{aligned} \text{Q. 19. } \frac{10}{2x-5} - \frac{2}{3x-2} \\ &= \frac{10(3x-2) - 2(2x-5)}{(2x-5)(3x-2)} \\ &= \frac{30x-20-4x+10}{(2x-5)(3x-2)} \\ &= \frac{26x-10}{(2x-5)(3x-2)} \end{aligned}$$

$$\begin{aligned} \text{Q. 20. } \frac{11}{x-2} + \frac{2}{2-x} &= \frac{11(2-x) + 2(x-2)}{(x-2)(2-x)} \\ &= \frac{22-11x+2x-4}{(x-2)(2-x)} \\ &= \frac{18-9x}{(x-2)(2-x)} \\ &= \frac{9(2-x)}{(x-2)(2-x)} \\ &= \frac{9}{x-2} \end{aligned}$$

**OR**

$$\begin{aligned} \frac{11}{x-2} + \frac{2}{2-x} \\ &= \frac{11}{x-2} - \frac{2}{x-2} \\ &= \frac{11-2}{x-2} \\ &= \frac{9}{x-2} \end{aligned}$$

$$\begin{aligned} \text{Q. 21. } \frac{3}{3x-4} - \frac{1}{4-3x} \\ &= \frac{3}{3x-4} + \frac{1}{3x-4} \\ &= \frac{4}{3x-4} \end{aligned}$$

$$\begin{aligned} \text{Q. 22. } \frac{7}{x-3} + \frac{2}{3-x} \\ &= \frac{7}{x-3} - \frac{2}{x-3} \\ &= \frac{5}{x-3} \end{aligned}$$

**Q. 23.** (i)  $\frac{1}{x} - \frac{3}{2x+4}$       Let  $x = 2$

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

$$= \frac{1}{2} - \frac{3}{8}$$

$$= \frac{4}{8} - \frac{3}{8}$$

$$= \frac{1}{8}$$

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

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

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

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

(iii) Let  $x = 2$

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

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

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

$$= \frac{2}{16}$$

$$= \frac{1}{8}$$

(iv) The answers to parts (i) and (iii) are the same.

**Q. 24.** (i)  $\frac{3}{2x-1} + \frac{2}{2x+4}$       Let  $x = -5$

$$= \frac{3}{2(-5)-1} + \frac{2}{2(-5)+4}$$

$$= \frac{3}{-10-1} + \frac{2}{-10+4}$$

$$= \frac{-3}{11} - \frac{2}{6}$$

$$= \frac{6(-3) - 2(11)}{66}$$

$$= \frac{-18 - 22}{66}$$

$$= \frac{-40}{66}$$

$$= \frac{-20}{33}$$

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

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

$$= \frac{6x+12+4x-2}{(2x-1)(2x+4)}$$

$$= \frac{10x+10}{(2x-1)(2x+4)}$$

$$= \frac{10(x+1)}{(2x-1)(2x+4)}$$

(iii) Let  $x = -5$

$$\frac{10(x+1)}{(2x-1)(2x+4)}$$

$$= \frac{10(-5+1)}{(2 \cdot -5-1)(2 \cdot -5+4)}$$

$$= \frac{10 \times -4}{-11 \times -6}$$

$$= \frac{-40}{66}$$

$$= \frac{-20}{33}$$

**Q. 25.** (i)  $\frac{4}{5x-2} + \frac{8}{x-3}$       Let  $x = \frac{1}{2}$

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

$$= \frac{4}{5(\frac{1}{2})-2} + \frac{8}{\frac{1}{2}-3}$$

$$= \frac{4}{2\frac{1}{2}-2} + \frac{8}{-2\frac{1}{2}}$$

$$= \frac{4}{\frac{1}{2}} + \frac{8}{-\frac{5}{2}}$$

$$= \frac{4}{1} \times \frac{2}{1} + \frac{8}{1} \times \frac{-2}{5}$$

$$= \frac{8}{1} - \frac{16}{5}$$

$$= \frac{40}{5} - \frac{16}{5} = \frac{24}{5}$$

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

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

$$= \frac{4x-12+40x-16}{(5x-2)(x-3)}$$

$$= \frac{44x-28}{(5x-2)(x-3)}$$

$$(iii) \text{ Let } x = \frac{1}{2}$$

$$\begin{aligned} & \frac{44\left(\frac{1}{2}\right) - 28}{\left(5\left(\frac{1}{2}\right) - 2\right)\left(\frac{1}{2} - 3\right)} \\ &= \frac{22 - 28}{\left(2\frac{1}{2} - 2\right)\left(-2\frac{1}{2}\right)} \\ &= \frac{-6}{+\frac{1}{2} \times -\frac{5}{2}} \\ &= \frac{-6}{-\frac{5}{4}} \\ &= \frac{6}{1} \times \frac{4}{5} \\ &= \frac{24}{5} \end{aligned}$$

$$\begin{aligned} \text{Q. 26. (i)} \quad & \frac{3}{x+1} + \frac{10}{x+2} \\ & \frac{3}{\frac{1}{2}+1} + \frac{10}{\frac{1}{2}+2} \\ & \frac{3}{\frac{3}{2}} + \frac{10}{\frac{5}{2}} \\ & 3 \times \frac{2}{3} + 10 \times \frac{2}{5} \\ & 2 + 4 = 6 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & \frac{3}{x+1} + \frac{10}{x+2} \\ &= \frac{3(x+2) + 10(x+1)}{(x+1)(x+2)} \\ &= \frac{3x+6+10x+10}{(x+1)(x+2)} \\ &= \frac{13x+16}{(x+1)(x+2)} \end{aligned}$$

$$\begin{aligned} \text{(iii) Let } x = \frac{1}{2} \\ & \frac{13\left(\frac{1}{2}\right) + 16}{\left(\frac{1}{2} + 1\right)\left(\frac{1}{2} + 2\right)} = \frac{6\frac{1}{2} + 16}{\frac{3}{2} \times \frac{5}{2}} \\ &= \frac{22\frac{1}{2}}{\frac{15}{4}} \\ &= \frac{45}{2} \\ &= \frac{15}{4} \\ &= \frac{3}{2} \times \frac{2}{1} \\ &= 6 \end{aligned}$$

## Exercise 13.2

$$\text{Q. 1. } \frac{\cancel{(x+1)}(x-3)}{\cancel{(x+1)}} = (x-3)$$

$$\begin{aligned} \text{Q. 2. } \frac{(x+4)\cancel{(x+2)}}{x+2} &= \frac{(x+4)\cancel{(x+2)}}{\cancel{(x+2)}} \\ &= (x+4) \\ &= x+4 \end{aligned}$$

$$\text{Q. 3. } \frac{5x+10}{x+2} = \frac{5\cancel{(x+2)}}{\cancel{(x+2)}} = 5$$

$$\begin{aligned} \text{Q. 4. } \frac{4x+2}{2} &= \frac{\cancel{2}(2x+1)}{\cancel{2}} = (2x+1) \\ &= 2x+1 \end{aligned}$$

$$\text{Q. 5. } \frac{3x-1}{3x-1} = \frac{\cancel{(3x-1)}}{\cancel{(3x-1)}} = 1$$

$$\text{Q. 6. } \frac{(5x+15)}{5} = \frac{\cancel{5}(x+3)}{\cancel{5}} = x+3$$

$$\text{Q. 7. } \frac{18y-4}{6y-2} = \frac{\cancel{2}(9y-2)}{\cancel{2}(3y-1)} = \frac{9y-2}{3y-1}$$

$$\begin{aligned} \text{Q. 8. } \frac{x^2-16}{x-4} &= \frac{\cancel{(x-4)}(x+4)}{\cancel{(x-4)}} \\ &= (x+4) = x+4 \end{aligned}$$

$$\text{Q. 9. } \frac{x^2-10x}{x-10} = \frac{x\cancel{(x-10)}}{\cancel{(x-10)}} = x$$

$$\begin{aligned} \text{Q. 10. } \frac{4x^2-64}{x-4} &= \frac{(2x-8)(2x+8)}{(x-4)} \\ &= \frac{2\cancel{(x-4)}(2x+8)}{\cancel{(x-4)}} \\ &= 2(2x+8) = 4x+16 \quad \text{or} \quad 4(x+4) \end{aligned}$$

$$\text{Q. 11. } \frac{2y-1}{1-2y} = \frac{-1\cancel{(1-2y)}}{\cancel{(1-2y)}} = -1$$

$$\begin{aligned} \text{Q. 12. } \frac{x^2+6x+8}{x+4} &= \frac{\cancel{(x+4)}(x+2)}{\cancel{(x+4)}} \\ &= x+2 \end{aligned}$$

$$\text{Q. 13. } \frac{8p^3q^2}{2pq^2} = \frac{\cancel{8} \cdot p \cdot p \cdot p \cdot \cancel{q} \cdot \cancel{q}}{\cancel{2} \cdot p \cdot \cancel{q} \cdot \cancel{q}} = 4p^2$$

$$\begin{aligned} \text{Q. 14. } \frac{100a^2bc}{5ac^2} &= \frac{\cancel{100} \times a \times \cancel{a} \times b \times \cancel{c}}{\cancel{5} \times \cancel{a} \times c \times \cancel{c}} \\ &= \frac{20ab}{c} \end{aligned}$$

$$\text{Q. 15. } \frac{x^2-x-6}{x+2} = \frac{(x+2)(x-3)}{x+2} = x-3$$

$$\begin{aligned} \text{Q. 16. } \frac{18p^3q^2r^2}{p^4q^2r} &= \frac{18 \cdot \cancel{p} \cdot \cancel{p} \cdot \cancel{p} \cdot \cancel{q} \cdot \cancel{q} \cdot r \cdot r}{\cancel{p} \cdot \cancel{p} \cdot \cancel{p} \cdot p \cdot \cancel{q} \cdot \cancel{q} \cdot r} \\ &= \frac{18 \cdot r}{p} \end{aligned}$$

$$\text{Q. 17. } \frac{2a^2 + 4a - 6}{2} = \frac{2(a^2 + 2a - 3)}{2}$$

$$= a^2 + 2a - 3$$

$$\text{Q. 18. } \frac{12x^3 + 18x^2 - 30x}{6x}$$

$$= \frac{6x(2x^2 + 3x - 5)}{6x} = 2x^2 + 3x - 5$$

$$\text{Q. 19. } \frac{4x^2 + 7x - 2}{x + 2} = \frac{\cancel{(x+2)}(4x - 1)}{\cancel{(x+2)}}$$

$$= 4x - 1$$

$$\text{Q. 20. } \frac{9x^2 - 3x - 2}{3x + 1} = \frac{\cancel{(3x+1)}(3x - 2)}{\cancel{(3x+1)}}$$

$$= 3x - 2$$

$$\text{Q. 21. (i) } 16x^2 - 16 = 16(x^2 - 1)$$

$$= 16(x - 1)(x + 1)$$

$$\text{(ii) } (x + 1)(x + 1)$$

$$\text{(iii) } \frac{16x^2 - 16}{x^2 + 2x + 1} = \frac{16(x - 1)\cancel{(x + 1)}}{(x + 1)\cancel{(x + 1)}}$$

$$= \frac{16(x - 1)}{x + 1}$$

$$\text{Q. 22. (i) } x^2 + 9x + 20 = (x + 5)(x + 4)$$

$$\text{(ii) } (x + 1)(x^2 + 9x + 20)$$

$$= x^3 + 9x^2 + 20x + x^2 + 9x + 20$$

$$= x^3 + 10x^2 + 29x + 20$$

$$\text{(iii) } \frac{x^3 + 10x^2 + 29x + 20}{(x + 4)}$$

$$= \frac{(x + 1)(x^2 + 9x + 20)}{(x + 4)}$$

$$= \frac{(x + 1) \cdot (x + 5) \cdot (x + 4)}{(x + 4)}$$

$$= (x + 1)(x + 5)$$

$$\text{(iv) Let } x = 2 \text{ Solution } (2 + 1)(2 + 5)$$

$$= 3 \times 7 = 21$$

$$\frac{x^3 + 10x^2 + 29x + 20}{x + 4}$$

$$= \frac{2^3 + 10(2^2) + 29(2) + 20}{2 + 4}$$

$$= \frac{8 + 40 + 58 + 20}{6}$$

$$= \frac{126}{6}$$

$$= 21$$

$$\text{Q. 23. (i) } x^2 - 10x + 21 = (x - 7)(x - 3)$$

$$\text{(ii) } (x - 5)(x^2 - 10x + 21)$$

$$= x^3 - 10x^2 + 21x - 5x^2$$

$$+ 50x - 105$$

$$= x^3 - 15x^2 + 71x - 105$$

$$\text{(iii) } \frac{x^3 - 15x^2 + 71x - 105}{x - 3}$$

$$= \frac{(x - 5)(x - 7)(x - 3)}{(x - 3)}$$

$$= (x - 5)(x - 7)$$

$$\text{(iv) Let } x = 4: (4 - 5)(4 - 7)$$

$$= (-1)(-3) = 3$$

$$x = 4: \frac{4^3 - 15(4^2) + 71(4) - 105}{4 - 3}$$

$$= 64 - 240 + 284 - 105$$

$$= 3$$

$$\text{Q. 24. (i) } 3x^2 - 17x - 6 = (3x + 1)(x - 6)$$

$$\text{(ii) } 1(3x^2 - 17x - 6) - x(3x^2 - 17x - 6)$$

$$3x^2 - 17x - 6 - 3x^3 + 17x^2 + 6x$$

$$- 3x^3 + 20x^2 - 11x - 6$$

$$\text{(iii) } \frac{(1 - x)(3x + 1)(x - 6)}{3x + 1}$$

$$= (1 - x)(x - 6)$$

$$\text{(iv) } \frac{-3(-1)^3 + 20(-1)^2 - 11(-1) - 6}{3(-1) + 1}$$

$$= \frac{28}{-2} = -14$$

$$(1 + 1)(-1 - 6) = -14$$

$$\text{Q. 25. } \frac{(x + 1)\cancel{(x + 3)}}{\cancel{(x + 3)}(x - 4)} = \frac{x + 1}{x - 4}$$

$$\text{Q. 26. } \frac{2x^2 + 9x + 4}{2x^2 + 11x + 5} = \frac{\cancel{(2x + 1)}(x + 4)}{\cancel{(2x + 1)}(x + 5)}$$

$$= \frac{x + 4}{x + 5}$$

$$\text{Q. 27. } \frac{20x^2 - 8x - 12}{5x^2 - 2x - 3} = \frac{4(5x^2 - 2x - 3)}{(5x^2 - 2x - 3)}$$

$$= 4$$

$$\text{Q. 28. } \frac{ax + ay - cx - cy}{ax + ay + cx + cy}$$

$$= \frac{a(x + y) - c(x + y)}{a(x + y) + c(x + y)} = \frac{\cancel{(x + y)}(a - c)}{\cancel{(x + y)}(a + c)}$$

$$= \frac{a - c}{a + c}$$

$$\begin{aligned} \text{Q. 29. } & \frac{2(6x^2 - x - 12)}{4(3x^2 + 13x + 12)} \\ &= \frac{(3x + 4)(2x - 3)}{2(3x + 4)(x + 3)} \\ &= \frac{2x - 3}{2(x + 3)} \end{aligned}$$

$$\begin{aligned} \text{Q. 30. } & \frac{a - b}{b^2 - a^2} = \frac{(a - b)}{(b - a)(b + a)} \\ &= \frac{-1 \cdot (b - a)}{(b - a)(b + a)} = \frac{-1}{b + a} \end{aligned}$$

### Exercise 13.3

$$\text{Q. 1. (i) } x^2 + 7x + 12 = (x + 4)(x + 3)$$

$$\text{(ii) } \frac{x^2 + 7x + 12}{x + 3} = \frac{(x + 4)(x + 3)}{(x + 3)} = x + 4$$

$$\begin{array}{r} \text{(iii)} \quad \frac{x + 4}{x + 3} \overline{) x^2 + 7x + 12} \\ \underline{x^2 + 3x} \phantom{+ 12} \\ 4x + 12 \\ \underline{4x + 12} \\ 0 \end{array}$$

Answer:  $x + 4$

$$\text{Q. 2. (i) } 2x^2 + 11x + 5 = (2x + 1)(x + 5)$$

$$\begin{aligned} \text{(ii) } & \frac{2x^2 + 11x + 5}{x + 5} = \frac{(2x + 1)(x + 5)}{(x + 5)} \\ &= 2x + 1 \end{aligned}$$

$$\begin{array}{r} \text{(iii)} \quad \frac{2x + 1}{x + 5} \overline{) 2x^2 + 11x + 5} \\ \underline{2x^2 + 10x} \phantom{+ 5} \\ x + 5 \\ \underline{x + 5} \\ 0 \end{array}$$

Answer:  $2x + 1$

$$\text{Q. 3. (i) } x^2 - 2x - 63 = (x - 9)(x + 7)$$

$$\begin{aligned} \text{(ii) } & \frac{x^2 - 2x - 63}{x - 9} = \frac{(x - 9)(x + 7)}{(x - 9)} \\ &= x + 7 \end{aligned}$$

$$\begin{array}{r} \text{(iii)} \quad \frac{x + 7}{x - 9} \overline{) x^2 - 2x - 63} \\ \underline{x^2 - 9x} \phantom{- 63} \\ 7x - 63 \\ \underline{7x - 63} \\ 0 \end{array}$$

Answer:  $x + 7$

$$\text{Q. 4. (i) } 6x^2 - 7x - 20 = (3x + 4)(2x - 5)$$

$$\begin{aligned} \text{(ii) } & \frac{6x^2 - 7x - 20}{2x - 5} = \frac{(3x + 4)(2x - 5)}{(2x - 5)} \\ &= 3x + 4 \end{aligned}$$

$$\begin{array}{r} \text{(iii)} \quad \frac{3x + 4}{2x - 5} \overline{) 6x^2 - 7x - 20} \\ \underline{6x^2 - 15x} \phantom{- 20} \\ 8x - 20 \\ \underline{8x - 20} \\ 0 \end{array}$$

Answer:  $3x + 4$

Q. 5.

$$\begin{array}{r} \frac{8x - 4}{x - 3} \overline{) 8x^2 - 28x + 12} \\ \underline{8x^2 - 24x} \phantom{+ 12} \\ 4x + 12 \\ \underline{4x + 12} \\ 0 \end{array}$$

Answer:  $8x - 4$

Q. 6.

$$\begin{array}{r} \frac{2x - 7}{3x + 5} \overline{) 6x^2 - 11x - 35} \\ \underline{6x^2 + 10x} \phantom{- 35} \\ -21x - 35 \\ \underline{-21x - 35} \\ 0 \end{array}$$

Answer:  $2x - 7$

$$\begin{array}{r}
 \text{Q. 7.} \\
 x + 3 \overline{) \begin{array}{l} x^2 + 2x + 1 \\ x^3 + 5x^2 + 7x + 3 \\ \underline{x^3 + 3x^2} \phantom{+ 7x + 3} \\ 2x^2 + 7x \phantom{+ 3} \\ \underline{2x^2 + 6x} \phantom{+ 3} \\ x + 3 \\ \underline{x + 3} \\ 0 \end{array} }
 \end{array}$$

Answer:  $x^2 + 2x + 1$

$$\begin{array}{r}
 \text{Q. 8.} \\
 x - 2 \overline{) \begin{array}{l} x^2 + 4x + 1 \\ x^3 + 2x^2 - 7x - 2 \\ \underline{x^3 - 2x^2} \phantom{- 7x - 2} \\ 4x^2 - 7x \phantom{- 2} \\ \underline{4x^2 - 8x} \phantom{- 2} \\ x - 2 \\ \underline{x - 2} \\ 0 \end{array} }
 \end{array}$$

Answer:  $x^2 + 4x + 1$

$$\begin{array}{r}
 \text{Q. 9.} \\
 x + 1 \overline{) \begin{array}{l} 3x + 5 \\ 3x^2 + 8x + 5 \\ \underline{3x^2 + 3x} \phantom{+ 5} \\ 5x + 5 \\ \underline{5x + 5} \\ 0 \end{array} }
 \end{array}$$

Answer:  $3x + 5$

$$\begin{array}{r}
 \text{Q. 10.} \\
 2x + 3 \overline{) \begin{array}{l} 8x - 5 \\ 16x^2 + 14x - 15 \\ \underline{16x^2 + 24x} \phantom{- 15} \\ -10x - 15 \\ \underline{-10x - 15} \\ 0 \end{array} }
 \end{array}$$

Answer:  $8x - 5$

$$\begin{array}{r}
 \text{Q. 11.} \\
 2x + 9 \overline{) \begin{array}{l} x^2 + 2x - 8 \\ 2x^3 + 13x^2 + 2x - 72 \\ \underline{2x^3 + 9x^2} \phantom{+ 2x - 72} \\ 4x^2 + 2x \phantom{- 72} \\ \underline{4x^2 + 18x} \phantom{- 72} \\ -16x - 72 \\ \underline{-16x - 72} \\ 0 \end{array} }
 \end{array}$$

Answer:  $x^2 + 2x - 8$

$$\begin{array}{r}
 \text{Q. 12.} \\
 3x - 2 \overline{) \begin{array}{l} x^2 - 8x - 6 \\ 3x^3 - 26x^2 - 2x + 12 \\ \underline{\ominus 3x^3 \oplus 2x^2} \phantom{- 2x + 12} \\ -24x^2 - 2x + 12 \\ \underline{\oplus 24x^2 \ominus 16x} \phantom{+ 12} \\ -18x + 12 \\ \underline{\oplus 18x \ominus 12} \\ 0 \end{array} }
 \end{array}$$

Answer:  $x^2 - 8x - 6$

$$\begin{array}{r}
 \text{Q. 13.} \\
 2x + 1 \overline{) \begin{array}{l} 2x^2 + 2x + 3 \\ 4x^3 + 6x^2 + 8x + 3 \\ \underline{4x^3 + 2x^2} \phantom{+ 8x + 3} \\ 4x^2 + 8x \phantom{+ 3} \\ \underline{4x^2 + 2x} \phantom{+ 3} \\ 6x + 3 \\ \underline{6x + 3} \\ 0 \end{array} }
 \end{array}$$

Answer:  $2x^2 + 2x + 3$

$$\begin{array}{r}
 \text{Q. 14.} \\
 2x + 5 \overline{) \begin{array}{l} 7x^2 + 4x - 2 \\ 14x^3 + 43x^2 + 16x - 10 \\ \underline{\ominus 14x^3 \oplus 35x^2} \phantom{+ 16x - 10} \\ 8x^2 + 16x - 10 \\ \underline{\ominus 8x^2 \oplus 20x} \phantom{- 10} \\ -4x - 10 \\ \underline{\oplus 4x \oplus 10} \\ 0 \end{array} }
 \end{array}$$

Answer:  $7x^2 + 4x - 2$

$$\begin{array}{r}
 \text{Q. 15.} \\
 7x - 6 \overline{) \begin{array}{l} 5x^2 - 3x + 8 \\ 35x^3 - 51x^2 + 74x - 48 \\ \underline{35x^3 - 30x^2} \phantom{+ 74x - 48} \\ -21x^2 + 74x \phantom{- 48} \\ \underline{-21x^2 + 18x} \phantom{- 48} \\ 56x - 48 \\ \underline{56x - 48} \\ 0 \end{array} }
 \end{array}$$

Answer:  $5x^2 - 3x + 8$

Q. 16.

$$\begin{array}{r}
 x^2 - 8x - 8 \\
 x - 1 \overline{) x^3 - 9x^2 + 8} \\
 \underline{x^3 - x^2} \phantom{+ 8} \\
 -8x^2 + 0x \phantom{+ 8} \\
 \underline{-8x^2 + 8x} \phantom{+ 8} \\
 -8x + 8 \\
 \underline{-8x + 8} \\
 0
 \end{array}$$

Answer:  $x^2 - 8x - 8$

Q. 17.

$$\begin{array}{r}
 x - 2 \\
 x + 2 \overline{) x^2 - 4} \\
 \underline{x^2 + 2x} \phantom{+ 4} \\
 -2x - 4 \\
 \underline{-2x - 4} \\
 0
 \end{array}$$

Answer:  $x - 2$

Q. 18.

$$\begin{array}{r}
 2x + 5 \\
 2x - 5 \overline{) 4x^2 - 25} \\
 \underline{4x^2 - 10x} \phantom{+ 25} \\
 10x - 25 \\
 \underline{10x - 25} \\
 0
 \end{array}$$

Answer:  $2x + 5$

Q. 19.

$$\begin{array}{r}
 3x^2 + x - 6 \\
 3x - 1 \overline{) 9x^3 - 19x + 6} \\
 \underline{\ominus 9x^3 \oplus 3x^2} \phantom{+ 6} \\
 3x^2 - 19x + 6 \\
 \underline{\ominus 3x^2 \oplus x} \phantom{+ 6} \\
 -18x + 6 \\
 \underline{\oplus 18x \oplus 6} \\
 0
 \end{array}$$

Answer:  $3x^2 + x - 6$

Q. 20. (i)  $(x + 2)(x - 7) = x^2 - 5x - 14$

$$\begin{aligned}
 \text{(ii) } (2x - 1)(x^2 - 5x - 14) &= 2x^3 - 10x^2 - 28x - x^2 + 5x + 14 \\
 &= 2x^3 - 11x^2 - 23x + 14
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) } \frac{2x^3 - 11x^2 - 23x + 14}{x - 7} &= \frac{(2x - 1)(x^2 - 5x - 14)}{(x - 7)} \\
 &= \frac{(2x - 1)(x + 2)(x - 7)}{(x - 7)} \\
 &= (2x - 1)(x + 2)
 \end{aligned}$$

$$\begin{array}{r}
 x^2 - 5x - 14 \\
 2x - 1 \overline{) 2x^3 - 11x^2 - 23x + 14} \\
 \underline{2x^3 - x^2} \phantom{+ 14} \\
 -10x^2 - 23x \phantom{+ 14} \\
 \underline{-10x^2 + 5x} \phantom{+ 14} \\
 -28x + 14 \\
 \underline{-28x + 14} \\
 0
 \end{array}$$

Answer:  $x^2 - 5x - 14$

Q. 21. (i)  $(2x + 3)(x - 4) = 2x^2 - 5x - 12$

$$\begin{aligned}
 \text{(ii) } (3x - 1)(2x^2 - 5x - 12) &= 6x^3 - 15x^2 - 36x - 2x^2 + 5x + 12 \\
 &= 6x^3 - 17x^2 - 31x + 12
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) } \frac{6x^3 - 17x^2 - 31x + 12}{2x + 3} &= \frac{(3x - 1)(2x^2 - 5x - 12)}{(2x + 3)} \\
 &= \frac{(3x - 1)(2x + 3)(x - 4)}{(2x + 3)} \\
 &= (3x - 1)(x - 4)
 \end{aligned}$$



$$\begin{array}{r}
 \text{(iv)} \quad \frac{2x^2 - 5x - 12}{3x - 1} \overline{) 6x^3 - 17x^2 - 31x + 12} \\
 \underline{6x^3 - 2x^2} \phantom{+ 12} \\
 -15x^2 - 31x \phantom{+ 12} \\
 \underline{-15x^2 + 5x} \phantom{+ 12} \\
 -36x + 12 \\
 \underline{-36x + 12} \\
 0
 \end{array}$$

Answer:  $2x^2 - 5x - 12$

$$\begin{array}{r}
 \text{Q. 22.} \quad \frac{x^2 + x - 12}{2x + 1} \overline{) 2x^3 + 3x^2 - 23x - 12} \\
 \underline{2x^3 + x^2} \phantom{- 23x - 12} \\
 2x^2 - 23x \phantom{- 12} \\
 \underline{2x^2 + x} \phantom{- 12} \\
 -24x - 12 \\
 \underline{-24x - 12} \\
 0
 \end{array}$$

Answer:  $x^2 + x - 12 = (x + 4)(x - 3)$

$$\begin{array}{r}
 \text{Q. 23.} \quad \frac{x^2 - x - 12}{x + 1} \overline{) x^3 - 13x - 12} \\
 \underline{x^3 + x^2} \phantom{- 12} \\
 -x^2 - 13x \phantom{- 12} \\
 \underline{-x^2 - x} \phantom{- 12} \\
 -12x - 12 \\
 \underline{-12x - 12} \\
 0
 \end{array}$$

Answer:  $x^2 - x - 12 = (x - 4)(x + 3)$

$$\begin{array}{r}
 \text{Q. 24.} \quad \frac{k^2 + 7k - 10}{2k - 5} \overline{) 2k^3 + 9k^2 - 55k + 50} \\
 \underline{2k^3 - 5k^2} \phantom{+ 50} \\
 14k^2 - 55k \phantom{+ 50} \\
 \underline{14k^2 - 35k} \phantom{+ 50} \\
 -20k + 50 \\
 \underline{-20k + 50} \\
 0
 \end{array}$$

Answer:  $k^2 + 7k - 10$

Let  $k = 3$

$$\begin{aligned}
 &k^2 + 7k - 10 \\
 &= 3^2 + 7(3) - 10 \\
 &= 20
 \end{aligned}$$

$$\begin{aligned}
 &2k^3 + 9k^2 - 55k + 50 \\
 &= 2(3)^3 + 9(3)^2 - 55(3) + 50 \\
 &= 54 + 81 - 165 + 50 \\
 &= 185 - 165 \\
 &= 20
 \end{aligned}$$

Q. 25. (i)  $4a^3 + 6a^2 - 27$

$$\begin{array}{r}
 \text{(ii)} \quad \frac{2a^2 + 6a + 9}{2a - 3} \overline{) 4a^3 + 6a^2 + 0a - 27} \\
 \underline{-(4a^3 + 6a^2)} \phantom{- 27} \\
 12a^2 + 0a \phantom{- 27} \\
 \underline{-(12a^2 + 18a)} \phantom{- 27} \\
 18a - 27 \\
 \underline{18a - 27} \\
 0
 \end{array}$$

Answer:  $2a^2 + 6a + 9$

**Q. 26.** (i)  $x^2 - 1 = (x - 1)(x + 1)$   
(ii)  $4x^2 - 7x + 3 = (4x - 3)(x - 1)$   
(iii)  $(x + 1)(4x^2 - 7x + 3) = 4x^3 - 7x^2 + 3x + 4x^2 - 7x + 3$   
 $= 4x^3 - 3x^2 - 4x + 3$   
(iv)  $\frac{4x^3 - 3x^2 - 4x + 3}{x^2 - 1} = \frac{\cancel{(x+1)}(4x^2 - 7x + 3)}{\cancel{(x+1)}(x - 1)}$   
 $= \frac{4x^2 - 7x + 3}{x - 1} = \frac{(4x - 3)(x - 1)}{(x - 1)}$   
 $= 4x - 3$

**Q. 27.**  $8x^3 - 1 \div 2x - 1$

$$\begin{array}{r} 4x^2 + 2x + 1 \\ 2x - 1 \overline{) 8x^3 + 0x^2 + 0x - 1} \\ \underline{8x^3 - 4x^2} \phantom{- 1} \\ 4x^2 + 0x \phantom{- 1} \\ \underline{4x^2 - 2x} \phantom{- 1} \\ 2x - 1 \phantom{- 1} \\ \underline{2x - 1} \\ 0 \end{array}$$

Answer:  $4x^2 + 2x + 1$

**Q. 28.**

$$\begin{array}{r} 9x^2 - 12x + 16 \\ 3x + 4 \overline{) 27x^3 + 0x^2 + 0x + 64} \\ \underline{27x^3 + 36x^2} \phantom{+ 0x + 64} \\ -36x^2 + 0x \phantom{+ 64} \\ \underline{-36x^2 - 48x} \phantom{+ 64} \\ 48x + 64 \\ \underline{48x + 64} \\ 0 \end{array}$$

Answer:  $9x^2 - 12x + 16$

## Revision Exercises

**Q. 1.** (a) (i)  $\frac{x + 1}{3} + \frac{x + 5}{2} = \frac{2(x + 1)}{6} + \frac{3(x + 5)}{6}$   
 $= \frac{2x + 2 + 3x + 15}{6}$   
 $= \frac{5x + 17}{6}$   
(ii)  $x + \frac{2x + 3}{7} = \frac{x}{1} + \frac{2x + 3}{7}$   
 $= \frac{7x}{7} + \frac{2x + 3}{7}$   
 $= \frac{9x + 3}{7}$

$$\begin{aligned} \text{(iii)} \quad \frac{5x-1}{2} - \frac{x-1}{3} &= \frac{3(5x-1) - 2(x-1)}{6} \\ &= \frac{15x-3-2x+2}{6} \\ &= \frac{13x-1}{6} \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad \frac{7x-2}{10} - \frac{2x-1}{5} + \frac{x+3}{2} &= \frac{7x-2-2(2x-1)+5(x+3)}{10} \\ &= \frac{7x-2-4x+2+5x+15}{10} \\ &= \frac{8x+15}{10} \end{aligned}$$

$$\text{(b) (i)} \quad \frac{3a}{6a} = \frac{1}{2}$$

$$\text{(ii)} \quad \frac{2a+2b}{3a+3b} = \frac{2(a+b)}{3(a+b)} = \frac{2}{3}$$

$$\text{(iii)} \quad \frac{2x-4}{x^2-4} = \frac{2(x-2)}{(x-2)(x+2)} = \frac{2}{x+2}$$

$$\begin{array}{r} \text{(c) (i)} \quad \begin{array}{r} x+10 \\ x+2 \overline{) x^2+12x+20} \\ \underline{x^2+2x} \phantom{+20} \\ 10x+20 \\ \underline{10x+20} \\ 0 \end{array} \end{array}$$

Answer:  $x + 10$

$$\begin{array}{r} \text{(ii)} \quad \begin{array}{r} 4a+2 \\ 3a+2 \overline{) 12a^2+14a+4} \\ \underline{12a^2+8a} \phantom{+4} \\ 6a+4 \\ \underline{6a+4} \\ 0 \end{array} \end{array}$$

Answer:  $4a + 2$

$$\begin{array}{r} \text{(iii)} \quad \begin{array}{r} 5c+7 \\ 3c-2 \overline{) 15c^2+11c-14} \\ \underline{15c^2-10c} \phantom{-14} \\ 21c-14 \\ \underline{21c-14} \\ 0 \end{array} \end{array}$$

Answer:  $5c + 7$

$$\text{Q. 2. (a) (i)} \quad \frac{(x-3)(x+4)}{(x+4)} = x - 3$$

$$\text{(ii)} \quad \frac{4(x+1)}{(x+1)} = 4$$

$$(iii) \frac{x^2 + 2x - 15}{x + 5} = \frac{\cancel{(x+5)}(x-3)}{\cancel{(x+5)}} = x - 3$$

$$(iv) \frac{4a^2 b^3}{2ab} = \frac{4\cancel{a} \cdot a \cdot \cancel{b} \cdot b \cdot b}{2 \cdot \cancel{a} \cdot \cancel{b}} = 2ab^2$$

$$(v) \frac{3x^2 - 2x - 5}{x + 1} = \frac{(3x - 5)\cancel{(x+1)}}{\cancel{(x+1)}} = 3x - 5$$

$$(b) (i) \frac{2x - 1}{5} - \frac{3x - 4}{2} + \frac{x + 5}{3} = \frac{6(2x - 1) - 15(3x - 4) + 10(x + 5)}{30}$$

$$= \frac{12x - 6 - 45x + 60 + 10x + 50}{30}$$

$$= \frac{-23x + 104}{30}$$

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

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

$$= \frac{11x - 13}{(x - 5)(3x - 1)}$$

$$(iii) \frac{4}{5x - 2} - \frac{7}{2 - 5x} = \frac{4(2 - 5x) - 7(5x - 2)}{(5x - 2)(2 - 5x)}$$

$$= \frac{22 - 55x}{(5x - 2)(2 - 5x)}$$

$$= \frac{11(2 - 5x)}{(5x - 2)(2 - 5x)}$$

$$= \frac{11}{5x - 2}$$

$$(c) (i) 2x^2 + 16x + 32 = 2(x^2 + 8x + 16) = 2(x + 4)(x + 4)$$

$$(ii) \frac{2x^2 + 16x + 32}{(x + 4)^2} = \frac{2(x + 4)(x + 4)}{(x + 4)^2} = 2$$

$$(iii) \frac{2x^2 + 16x + 32}{(x + 4)^2} = \frac{2(5)^2 + 16(5) + 32}{81} = 2$$

**Q. 3.** (a) (i)  $\frac{2x - 6}{4x - 12} = \frac{(2x - 6)}{2(2x - 6)}$

$$= \frac{1}{2}$$

$$(ii) \frac{x^2 - 9}{x^2 - 4x + 3} = \frac{\cancel{(x-3)}(x+3)}{\cancel{(x-3)}(x-1)}$$

$$= \frac{x + 3}{x - 1}$$

$$(iii) \frac{x^2 - 7x + 6}{2x - 12} = \frac{(x - 6)(x - 1)}{2(x - 6)}$$

$$= \frac{x - 1}{2}$$

$$(iv) \frac{2x^2 + x - 28}{2x + 8} = \frac{(2x - 7)(x + 4)}{2(x + 4)}$$

$$= \frac{2x - 7}{2}$$

$$(b) \quad (i) \quad \frac{2x^2 + 7x - 4}{x + 4} = \frac{(2x - 1)(x + 4)}{(x + 4)} = 2x - 1$$

$$(ii) \quad \begin{array}{r} x^2 + 7x - 10 \\ 2x - 5 \overline{) 2x^3 + 9x^2 - 55x + 50} \\ \underline{2x^3 - 5x^2} \phantom{+ 50} \\ 14x^2 - 55x \phantom{+ 50} \\ \underline{14x^2 - 35x} \phantom{+ 50} \\ -20x + 50 \\ \underline{-20x + 50} \\ 0 \end{array}$$

Answer:  $x^2 + 7x - 10$

$$(iii) \quad \begin{array}{r} 2x^2 - 6x + 1 \\ 3x + 2 \overline{) 6x^3 - 14x^2 - 9x + 2} \\ \underline{6x^3 + 4x^2} \phantom{- 9x + 2} \\ -18x^2 - 9x \phantom{+ 2} \\ \underline{-18x^2 - 12x} \phantom{+ 2} \\ 3x + 2 \\ \underline{3x + 2} \\ 0 \end{array}$$

Answer:  $2x^2 - 6x + 1$

$$(iv) \quad \begin{array}{r} 4x^2 + 2x + 26 \\ 2x - 1 \overline{) 8x^3 + 50x - 26} \\ \underline{8x^3 - 4x^2} \phantom{+ 50x - 26} \\ 4x^2 + 50x \phantom{- 26} \\ \underline{4x^2 - 2x} \phantom{- 26} \\ 52x - 26 \\ \underline{52x - 26} \\ 0 \end{array}$$

Answer:  $4x^2 + 2x + 26$

$$(c) \quad \frac{8}{x - 5} - \frac{12}{5 - x} = \frac{8}{x - 5} + \frac{12}{x - 5} = \frac{20}{x - 5}$$

$$\text{Let } x = 9 \quad \text{Solution} = \frac{20}{9 - 5} = \frac{20}{4} = 5$$

$$\begin{aligned} \text{Using } \frac{8}{x - 5} - \frac{12}{5 - x} &= \frac{8}{9 - 5} - \frac{12}{5 - 9} \\ &= \frac{8}{4} - \frac{12}{-4} \\ &= 2 - -3 \\ &= 5 \end{aligned}$$

Same

Q. 4. (a) (i)

$$\begin{array}{r}
 2x - 3 \overline{) 4x^2 - 12x + 9} \\
 \underline{4x^2 - 6x} \phantom{+ 9} \\
 -6x + 9 \\
 \underline{-6x + 9} \\
 0
 \end{array}$$

$$\text{So } \frac{4x^2 - 12x + 9}{2x - 3} = 2x - 3$$

(ii)

$$\begin{array}{r}
 3x^2 + 4x - 3 \overline{) 12x^3 + 13x^2 - 16x + 3} \\
 \underline{12x^3 - 3x^2} \phantom{- 16x + 3} \\
 16x^2 - 16x \phantom{+ 3} \\
 \underline{16x^2 - 4x} \phantom{+ 3} \\
 -12x + 3 \\
 \underline{-12x + 3} \\
 0
 \end{array}$$

$$\text{So } \frac{12x^3 + 13x^2 - 16x + 3}{4x - 1} = 3x^2 + 4x - 3$$

(iii)

$$\begin{array}{r}
 x^2 + 5x + 6 \overline{) x^3 - 19x - 30} \\
 \underline{x^3 - 5x^2} \phantom{- 19x - 30} \\
 5x^2 - 19x \phantom{- 30} \\
 \underline{5x^2 - 25x} \phantom{- 30} \\
 6x - 30 \\
 \underline{6x - 30} \\
 0
 \end{array}$$

$$\text{So } \frac{x^3 - 19x - 30}{x - 5} = x^2 + 5x + 6$$

(iv)

$$\begin{array}{r}
 x^2 + 3x + 1 \overline{) 3x^3 + 8x^2 - 1} \\
 \underline{\ominus 3x^3 \oplus x^2} \phantom{- 1} \\
 9x^2 - 1 \\
 \underline{9x^2 \oplus 3x} \phantom{- 1} \\
 3x - 1 \\
 \underline{-3x \oplus 1} \\
 0
 \end{array}$$

$$\text{Answer: } x^2 + 3x + 1$$

(b) (i)  $\frac{3}{x-1} - \frac{8}{1-x} = \frac{3}{x-1} + \frac{8}{x-1} = \frac{11}{x-1}$

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

$$\begin{aligned}
 \text{(iii)} \quad & \frac{3}{x-1} - \frac{8}{1-x} + \frac{x+3}{x^2+2x-3} \\
 & = \frac{11}{x-1} + \frac{(x+3)}{(x-1)(x+3)} = \frac{11}{x-1} + \frac{1}{x-1} \\
 & = \frac{12}{x-1}
 \end{aligned}$$

Q. 5. (i)

Divisor	Quotient	Dividend
$6x - 1$	$x - 5$	$6x^2 - 31x + 5$
$4x - 1$	$2x + 1$	$8x^2 + 2x - 1$
$x - 1$	$x^2 - 3x - 4$	$x^3 - 4x^2 - x + 4$
$2x - 3$	$6x^2 - 3x + 4$	$12x^3 - 24x^2 + 17x - 12$

$$\begin{array}{r}
 x^2 - 3x - 4 \\
 x - 1 \overline{) x^3 - 4x^2 - x + 4} \\
 \underline{\ominus x^3 \oplus x^2} \phantom{+ 4} \\
 -3x^2 - x + 4 \\
 \underline{\oplus 3x^2 \oplus 3x} \phantom{+ 4} \\
 -4x + 4 \\
 \underline{\oplus 4x \oplus 4} \\
 0
 \end{array}$$

$$(2x - 3)(6x^2 - 3x + 4)$$

$$2x(6x^2 - 3x + 4) - 3(6x^2 - 3x + 4)$$

$$12x^3 - 6x^2 + 8x - 18x^2 + 9x - 12$$

$$12x^3 - 24x^2 + 17x - 12$$

$$\begin{array}{r}
 3x + 5 \\
 x^2 - 16 \overline{) 3x^3 + 5x^2 - 48x - 80} \\
 \underline{3x^3 - 48x} \phantom{- 80} \\
 5x^2 + 48x - 48x - 80 \\
 \underline{5x^2 - 80} \\
 0
 \end{array}$$

Division:  $3x + 5$

$$p = 3$$

$$q = 5$$