

EXERCISE 3.1

1. (a) $-2x^3 + 6x^2 + x - 7$ (b) $x^4 - x^3 + 12x^2 + 2x - 9$ (c) $6x^5 - 7x^3 + 9x^2 + 2x - 6$
 (d) $2x^7 - 2x^6 - x^5 + 8x^4 - 5x^3 - 2x^2 + 7x - 3$ (e) $4x^6 - 4x^4 + 12x^3 + x^2 - 6x + 9$
 (f) $9x^3 - 12x^2 - 18x + 13$ 2. $3x + 1 + \frac{2}{x-1}$ 3. $2x^2 - 3x + 11 - \frac{8}{2x-1}$
 4. $x^2 - x - 5 + \frac{19-6x}{x^2-2x+3}$ 5. $2x^2 - 7x + 7 - \frac{17}{x+1}$ 6. $x^2 - 1 + \frac{3-x}{x^2+3}$
 7. $(3x-1)(\frac{16}{3} - 3x - 2x^2) + \frac{52}{3}$ 8. 1 9. -1 10. -12 11. 5

EXERCISE 3.2

1. $(x-1)(2x-3) - 2$ 2. $(x-3)(3x^2 + 10x + 29) + 90$ 3. $(x+3)(2x^3 - 7x^2 + 19x - 57) + 174$
 4. $(2x-1)(x^2 - 2x + 4) + 1$ 5. $(x+2)(2x^3 - 4x^2 + 11x - 23) + 46$
 6. $(4-x)(x^3 + 4x^2 + 18x + 72) - 283$

EXERCISE 3.3

1. (a) -6 (b) 15 (c) 8 (d) 1.25 (e) $-\frac{155}{27}$ 2. 6 3. (a) 7 (b) 70 (c) $-21x + 28$ 4. -6 5. (a) 11 (b) 3

EXERCISE 3.4

1. (a) $(x-3)(x-2)(x+5)$ (b) $(x-2)(x^2 + 3x + 5)$ (c) $(x-2)(x-1)(x+2)$
 (d) $(x-2)(x+2)(3x+1)$ (e) $(x-3)(x+3)(2x-1)$ (f) $(x-2)(x-1)(x^2 + 3x + 4)$
 (g) $(x-2)^2(x+3)$ (h) $(x-2)^2(5x-4)$ (i) $-(x+4)(2x-5)(5x+2)$ (j) $-(x+1)^2(5x-1)$

2. $6x^3 - 4x^2 - 2x + 3$ 3. $-\frac{47}{8}$ 4. 0, $(x+4)(x+1)(x-3)$ 5. $(2x+1)(x+2)^2$

6. $(x-5)(x^2 + x + 2)$ 7. $(x-1)^2(2x-1)(3x+2)$ 8. (a) $-(x-1)(x+2)(3x-1)^2$ (b) 1, $-2, \frac{1}{3}$

9. $a = -1, b = -2$ 11. $a = -2, b = 1$ 13. $a = -9, b = 24, (6x^2 + 9x - 2)$

14. $x^3 - 2x^2 + 8x + 2$ 15. $3x^3 - 5x^2 + 6x + 4$ 16. $a + c = b + d$ 17. -8

18. $a = 1, b = -3, c = 3, d = -1$ 19. $(x-2)(2x+1)(3x+2)$

20. (a) $m = \frac{18}{5}, n = \frac{39}{5}, k = -\frac{78}{5}$ (b) $(x-2), (x+3)$

21. $m = 3, n = -4, k = -12; x^3 + 3x^2 - 4x - 12 = (x-2)(x+2)(x+3)$

22. $k = -2, n = 3$ 24. $a = 3, b = -6; a = -3, b = 6$ 26. $(\alpha^2 + \alpha\beta + \beta^2)x - \alpha\beta(\alpha + \beta)$

EXERCISE 3.5.1

1. (a) -3, -1, 2 (b) $-\frac{1}{2}, 1, 2$ (c) -2, -1, 3 (d) $\frac{1}{3}, \frac{3}{2}, 4$ (e) $\frac{1}{2}$ (f) -1, 3 (g) -4, 1 (h) -2, $2 \pm \sqrt{10}$

- (i) $-\frac{1}{2}, -2 \pm \sqrt{2}$ (j) $\frac{1}{3}, \pm\sqrt{6}$ 2. $\frac{1}{2}, 1, 5$ 3. $-\frac{3}{2}, \frac{1}{2}, 2$ 4. -1, -2, 3 5. -4, 1

6. (a) $(x+2)(x-3)(x+4) = 0$ (b) $(x+1)(x-0.5)(x-2) = 0$ (c) $8x^3 - 16x^2 - 2x + 4 = 0$

7. (a) $-\frac{7 \pm \sqrt{337}}{12}, 1$ (b) -1, 1 (c) -4, -1, 2 (d) $1, \frac{3}{2}, 3$ 8. (a) -1.75, 0.432, 1.32 (b) 3.77

- (c) 0.309 (d) -1.68, -0.421, 0.421, 1.68 9. -3, $-\frac{1}{2}, 2$ 10. No other solutions

11. $m = 1, n = -6; x = 6, -1, 2$ 12. 1, 4, 7

EXERCISE 3.5.2

1. (a) $[-1, 1] \cup [2, \infty)$ (b) $]-\infty, -2] \cup [2, 3]$ (c) $[-3, -2] \cup [2, \infty[$ (d) $]0, \infty[\setminus \{1\}$ (e) $\{-2\} \cup [-0.5, \infty[$
 (f) $]-\infty, -4[\cup]-2, 2[$ (g) $]-\infty, 1[\cup]2, \infty[\setminus \{-1\}$ (h) $]-\infty, 2[\cup \{3\}$

2. (a) $]-3, -1[\cup]2, \infty[$ (b) $]-\infty, -\frac{1}{2}] \cup [1, 2]$ (c) $[-2, -1] \cup [3, \infty[$ (d) $]-\frac{1}{3}, \frac{3}{2}] \cup [4, \infty[$ (e) $[\frac{1}{2}, \infty[$

- (f) $]3, \infty[$ (g) $]-\infty, -4[$ (h) $[-2, 2 - \sqrt{10}] \cup [2 + \sqrt{10}, \infty[$ (i) $]-\infty, -2 - \sqrt{2}] \cup [-2 + \sqrt{2}, -\frac{1}{2}]$

- (j) $]-\infty, -\sqrt{6}[\cup]\frac{1}{3}, \sqrt{6}[$ (k) $]-\infty, 1]$ (l) $]-\infty, \frac{1-\sqrt{13}}{2}] \cup]\frac{1+\sqrt{13}}{2}, \infty[$

EXERCISE 3.6

