

Exercise 1 (Question 1-12)

$$x^2 + 3x$$

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

$$x^3 + x^2 + 2x + 2$$

$$2x^2 + 3$$

$$x^3 + 2x^2 + 5$$

$$x^3 + 2x^2 + x$$

$$2x^3 + 3x^2 + x + 4$$

$$2x^2 + 2x + 3$$

$$x^2 + 3x + 1$$

$$x^2 + 4$$

$$x^2 - 2x - 2$$

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

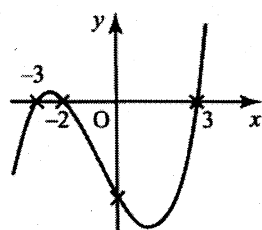
Exercise 2

1 (i) 0, 0, -8, -18, -24, -20, 0

(ii) $(x+3)(x+2)(x-3)$

(iii) -3, -2 or 3

(iv)

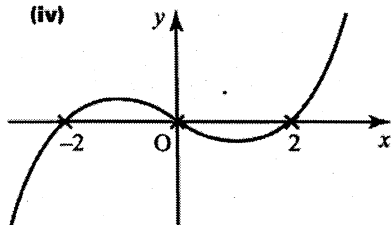


2 (i) -15, 0, 3, 0, -3, 0, 15

(ii) $x(x+2)(x-2)$

(iii) -2, 0 or 2

(iv)



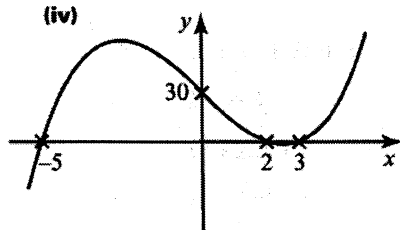
Exercise 2

3 (i) 30, 0, $(x-3)$

(ii) $p=2, q=-15$

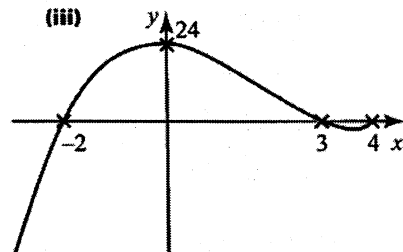
(iii) -5, 2 or 3

(iv)



4 (ii) -2, 3 or 4

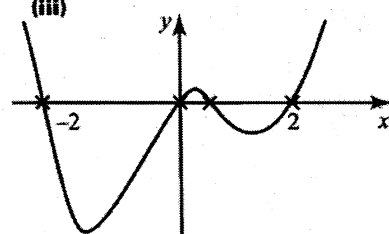
(iii)



5 (i) 0

(ii) $-1 \pm \sqrt{2}$

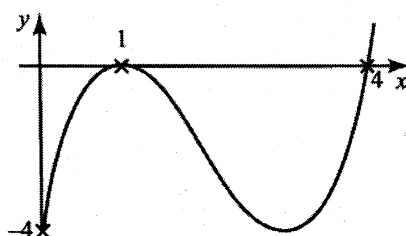
(iii)



6 (i) -4

(ii) $(x-1)^2$

(iii)



7 (i) $a=2, b=1, c=2$

(ii) 0, $\sqrt{3}$ or $-\sqrt{3}$

Exercise 2

8 (i) $(x^2-4)(x^2-1)$

(ii) $(x+2)(x-2)(x^2+1)$

(iii) Two real roots: -2 and 2

9 (ii) $2x^2 + 9x + 11$ remainder 19

10 (i) $\pm 6, \pm 3, \pm 2, \pm 1,$

(ii) -1, 2 or 3

11 (i) $(x-1)(x-2)(x+2)$

(ii) $(x+1)(x^2-x+1)$

(iii) $(x-2)(x^2+2x+5)$

(iv) $(x+2)(x^2-x+3)$

12 (ii) (a) $x^3 - 2x^2 + 2x + 2$

remainder -6

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

remainder -2

(c) $x^2 - 2x + 4$

remainder $-2x - 4$

13 -12

14 2 or -5

15 -5; 4; 4

16 -1; -7; 1, -2 or $\frac{3}{2}$

Exercise 3

- 1 (i) $x = -9$ or $x = 1$
- (ii) $x = -7$ or $x = 1$
- (iii) $x = -1$ or $x = 7$
- (iv) $x = -\frac{3}{2}$ or $x = 2$
- (v) $x = -3$ or $x = 2$
- (vi) $x = 1$ or $x = 7$
- (vii) $x = -2$ or $x = 4$
- (viii) $x = -\frac{8}{3}$ or $x = 2$
- (ix) $x = -1$ or $x = \frac{3}{2}$
- 2 (i) $-8 < x < 2$
- (ii) $0 \leq x \leq 4$
- (iii) $x < -1$ or $x > 11$
- (iv) $x \leq -3$ or $x \geq 1$
- (v) $-2 < x < 5$
- (vi) $-\frac{2}{3} \leq x \leq 2$
- 3 (i) $|x - 1| < 2$
- (ii) $|x - 5| < 3$
- (iii) $|x - 1| < 3$
- (iv) $|x - 2.5| < 3.5$
- (v) $|x - 10| < 0.1$
- (vi) $|x - 4| < 3.5$
- 5 (i) $x < \frac{1}{2}$
- (ii) $x < \frac{7}{2}$
- (iii) $x \geq -\frac{1}{2}$
- (iv) $-1 \leq x \leq 3$
- (v) $x < -1$ or $x > 3$
- (vi) $x \leq -6$ or $x \geq -\frac{4}{3}$

Exercise 4A

- 1 $\frac{3}{2(x+1)} - \frac{1}{2(x-1)}$
- 2 $\frac{13}{6(x-7)} - \frac{1}{6(x-1)}$
- 3 $\frac{4}{5(x-2)} - \frac{4}{5(x+3)}$
- 4 $\frac{7}{9(2x-1)} + \frac{28}{9(x+4)}$
- 5 $\frac{1}{x-2} - \frac{1}{x}$
- 6 $\frac{3}{x-2} - \frac{1}{x-1}$
- 7 $\frac{1}{2(x-3)} - \frac{1}{2(x+3)}$
- 8 $\frac{7}{3x} - \frac{1}{3(x+1)}$
- 9 $\frac{9}{x} - \frac{18}{2x+1}$
- 10 $\frac{2}{5(x-1)} - \frac{1}{5(3x+2)}$
- 11 $\frac{1}{x-1} - \frac{1}{x+1}$
- 12 $\frac{1}{(x-2)} - \frac{1}{(x+1)}$
- 13 $\frac{1}{3(x-3)} - \frac{1}{3x}$
- 14 $\frac{1}{x-1} - \frac{1}{x+3}$
- 15 $\frac{1}{2(x-1)} - \frac{1}{2(x+1)}$
- 16 $\frac{1}{2x-1} - \frac{1}{2x+1}$
- 17 $\frac{1}{x-1} + \frac{1}{x+1} + \frac{1}{x+2}$
- 18 $\frac{1}{2(x+3)} - \frac{1}{4(x-1)} + \frac{3}{4(x+2)}$

Exercise 4B

- 1 $\frac{1}{2(x-1)} - \frac{1}{2(x+1)} - \frac{1}{(x+1)^2}$
- 2 $\frac{3}{2x} - \frac{x}{2(x^2+2)}$
- 3 $\frac{11}{8(x-3)} + \frac{5}{8(x+1)} - \frac{1}{2(x+1)^2}$
- 4 $\frac{1}{x} - \frac{x}{2x^2+1}$
- 5 $\frac{1}{x-1} - \frac{1}{x-2} + \frac{2}{(x-2)^2}$
- 6 $\frac{2}{x} - \frac{1}{x^2} - \frac{3}{2x+1}$
- 7 $\frac{7}{16(x+3)} - \frac{1}{4(x-1)^2} + \frac{9}{16(x-1)}$
- 8 $\frac{3}{(x+2)^2} + \frac{2}{x+2} - \frac{2}{x+1}$
- 9 $\frac{1}{2(x-2)} - \frac{1}{6(x+2)} - \frac{1}{3(x-1)}$

Exercise 4C

- 1 $1 + \frac{1}{2(x-1)} - \frac{1}{2(x+1)}$
- 2 $1 + \frac{2}{x-1} - \frac{2}{x+1}$ or $1 + \frac{4}{x^2-1}$
- 3 $1 - \frac{7}{4(x+3)} - \frac{1}{4(x-1)}$
- 4 $1 - \frac{2x+1}{5(x^2+1)} - \frac{8}{5(x+2)}$

Exercise 4D

- 3 $-\frac{8}{9x} + \frac{1}{3x^2} + \frac{8}{9(x-3)}$
- 4 $\frac{1}{x+4} - \frac{x}{x^2+1}$
- 5 $\frac{1}{2(x+3)} + \frac{2}{(x-1)^2} - \frac{1}{2(x-1)}$
- 6 $\frac{1}{4(x-1)} - \frac{1}{2(x+1)^2} + \frac{3}{4(x+1)}$
- 7 $\frac{1}{6(x-1)} + \frac{5-x}{6(x^2+5)}$
- 8 $\frac{5}{6(x+2)} - \frac{5x-4}{6(x^2+2)}$
- 9 (a) $1 + \frac{1}{x+1} - \frac{4}{x+2}$
- (b) $1 + \frac{3}{x^2} - \frac{3}{x} + \frac{2}{x+1}$

Exercise 5

- 1 $1 - x + \frac{x^2}{2} - \frac{x^3}{2}, -\frac{1}{2} < x < \frac{1}{2}$
- 2 $1 - 10x + 75x^2 - 500x^3, -\frac{1}{5} < x < \frac{1}{5}$
- 3 $1 + \frac{3}{2}x + \frac{3}{2}x^2 + \frac{5}{4}x^3, -2 < x < 2$
- 4 $1 + \frac{3}{2}x + \frac{3}{8}x^2 - \frac{1}{16}x^3, -1 < x < 1$
- 5 $\frac{1}{3} - \frac{x}{9} + \frac{x^2}{27} - \frac{x^3}{81}, -3 < x < 3$
- 6 $1 - \frac{x}{4} + \frac{3x^2}{32} - \frac{5x^3}{128}, -2 < x < 2$
- 7 $1 + 2x + 3x^2 + 4x^3, -1 < x < 1$
- 8 $1 - \frac{1}{2}x + \frac{3}{8}x^2 - \frac{5}{16}x^3, -1 < x < 1$
- 9 $1 + \frac{1}{2}x - \frac{5}{8}x^2 - \frac{3}{16}x^3, -1 < x < 1$
- 10 $-2 - 3x - 3x^2 - 3x^3, -1 < x < 1$
- 11 $2 + 2x + \frac{21}{4}x^2 + \frac{27}{2}x^3, -\frac{1}{3} < x < \frac{1}{3}$
- 12 $\frac{1}{2} - \frac{3}{4}x + \frac{13}{8}x^2 - \frac{51}{16}x^3, -\frac{1}{2} < x < \frac{1}{2}$
- 13 $1 + x + \frac{1}{2}x^2 + \frac{1}{2}x^3, -1 < x < 1$
- 14 $1 - \frac{1}{9}x^2, -3 < x < 3$
- 15 $x + x^2 + 3x^3, -\frac{1}{2} < x < \frac{1}{2}$
- 16 $x - x^2 + x^3, -1 < x < 1$
- 17 $1 - 3p^{-1} + 6p^{-2} - 10p^{-3} + 15p^{-4}, |p| < 1$
- 18 $1 + 2x + 2x^2, -\frac{1}{2} < x < \frac{1}{2}$
- 19 $1 - 3x + \frac{7}{2}x^2$
- 21 $1 + 2x + 5x^2$

Exercise 6

- 1 (i) $4 + 20x + 72x^2$
 (ii) $-4 - 10x - 16x^2$
 (iii) $\frac{5}{2} + \frac{11x}{4} + \frac{33x^2}{8}$
 (iv) $-\frac{1}{8} - \frac{5x}{16} - \frac{x^2}{8}$
- 2 (i) $\frac{2}{(2x-1)} - \frac{3}{(x+2)}$
 (ii) $1 + 2x + 4x^2 + \dots$
 $a=1, b=2, c=4, \text{ for } |x| < \frac{1}{2}$
 (iii) $\frac{1}{2} - \frac{x}{4} + \frac{x^2}{8} \text{ for } |x| < 2$
 (iv) $\frac{7}{2} - \frac{13x}{4} - \frac{67x^2}{8}; 0.505\%$
- 3 (i) $2 + x - x^2$
 $\frac{2}{(2-x)} - \frac{1}{(1+x)}$
 (ii) $|x| < 1$
- 4 (i) $\frac{1}{(1-x)} - \frac{9}{(3-x)}$
 (ii) $0, 1\frac{1}{2}$
 (iii) $\frac{4x}{3} + \frac{8x^2}{3}$