

ANSWERS

EXERCISE 7.1

1. $-\frac{1}{2}\cos 2x$ 2. $\frac{1}{3}\sin 3x$ 3. $\frac{1}{2}e^{2x}$
4. $\frac{1}{3a}(ax+b)^3$ 5. $-\frac{1}{2}\cos 2x - \frac{4}{3}e^{3x}$ 6. $\frac{4}{3}e^{3x} + x + C$
7. $\frac{x^3}{3} - x + C$ 8. $\frac{ax^3}{3} + \frac{bx^2}{2} + cx + C$ 9. $\frac{2}{3}x^3 + e^x + C$
10. $\frac{x^2}{2} + \log|x| - 2x + C$ 11. $\frac{x^2}{2} + 5x + \frac{4}{x} + C$
12. $\frac{2}{7}x^{\frac{7}{2}} + 2x^{\frac{3}{2}} + 8\sqrt{x} + C$ 13. $\frac{x^3}{3} + x + C$
14. $\frac{2}{3}x^{\frac{3}{2}} - \frac{2}{5}x^{\frac{5}{2}} + C$ 15. $\frac{6}{7}x^{\frac{7}{2}} + \frac{4}{5}x^{\frac{5}{2}} + 2x^{\frac{3}{2}} + C$
16. $x^2 - 3\sin x + e^x + C$ 17. $\frac{2}{3}x^3 + 3\cos x + \frac{10}{3}x^{\frac{3}{2}} + C$
18. $\tan x + \sec x + C$ 19. $\tan x - x + C$
20. $2\tan x - 3\sec x + C$ 21. C
22. A

EXERCISE 7.2

1. $\log(1+x^2) + C$ 2. $\frac{1}{3}(\log|x|)^3 + C$ 3. $\log|1+\log x| + C$
4. $\cos(\cos x) + C$ 5. $-\frac{1}{4a}\cos 2(ax+b) + C$
6. $\frac{2}{3a}(ax+b)^{\frac{3}{2}} + C$ 7. $\frac{2}{5}(x+2)^{\frac{5}{2}} - \frac{4}{3}(x+2)^{\frac{3}{2}} + C$

8. $\frac{1}{6}(1+2x^2)^{\frac{3}{2}} + C$ 9. $\frac{4}{3}(x^2+x+1)^{\frac{3}{2}} + C$ 10. $2\log|\sqrt{x}-1| + C$
11. $\frac{2}{3}\sqrt{x+4}(x-8) + C$
12. $\frac{1}{7}(x^3-1)^{\frac{7}{3}} + \frac{1}{4}(x^3-1)^{\frac{4}{3}} + C$ 13. $-\frac{1}{18(2+3x^3)^2} + C$
14. $\frac{(\log x)^{1-m}}{1-m} + C$ 15. $-\frac{1}{8}\log|9-4x^2| + C$ 16. $\frac{1}{2}e^{2x+3} + C$
17. $-\frac{1}{2e^{x^2}} + C$ 18. $e^{\tan^{-1}x} + C$ 19. $\log(e^x + e^{-x}) + C$
20. $\frac{1}{2}\log(e^{2x} + e^{-2x}) + C$ 21. $\frac{1}{2}\tan(2x-3) - x + C$
22. $-\frac{1}{4}\tan(7-4x) + C$ 23. $\frac{1}{2}(\sin^{-1}x)^2 + C$
24. $\frac{1}{2}\log|2\sin x + 3\cos x| + C$ 25. $\frac{1}{(1-\tan x)} + C$
26. $2\sin\sqrt{x} + C$ 27. $\frac{1}{3}(\sin 2x)^{\frac{3}{2}} + C$ 28. $2\sqrt{1+\sin x} + C$
29. $\frac{1}{2}(\log \sin x)^2 + C$ 30. $-\log|1+\cos x| + C$ 31. $\frac{1}{1+\cos x} + C$
32. $\frac{x}{2} - \frac{1}{2}\log|\cos x + \sin x| + C$ 33. $\frac{x}{2} - \frac{1}{2}\log|\cos x - \sin x| + C$
34. $2\sqrt{\tan x} + C$ 35. $\frac{1}{3}(1+\log x)^3 + C$ 36. $\frac{1}{3}(x+\log x)^3 + C$
37. $-\frac{1}{4}\cos(\tan^{-1}x^4) + C$ 38. D
39. B

EXERCISE 7.3

1. $\frac{x}{2} - \frac{1}{8} \sin(4x+10) + C$
2. $-\frac{1}{14} \cos 7x + \frac{1}{2} \cos x + C$
3. $\frac{1}{4} \left[\frac{1}{12} \sin 12x + x + \frac{1}{8} \sin 8x + \frac{1}{4} \sin 4x \right] + C$
4. $-\frac{1}{2} \cos(2x+1) + \frac{1}{6} \cos^3(2x+1) + C$
5. $\frac{1}{6} \cos^6 x - \frac{1}{4} \cos^4 x + C$
6. $\frac{1}{4} \left[\frac{1}{6} \cos 6x - \frac{1}{4} \cos 4x - \frac{1}{2} \cos 2x \right] + C$
7. $\frac{1}{2} \left[\frac{1}{4} \sin 4x - \frac{1}{12} \sin 12x \right] + C$
8. $2 \tan \frac{x}{2} - x + C$
9. $x - \tan \frac{x}{2} + C$
10. $\frac{3x}{8} - \frac{1}{4} \sin 2x + \frac{1}{32} \sin 4x + C$
11. $\frac{3x}{8} + \frac{1}{8} \sin 4x + \frac{1}{64} \sin 8x + C$
12. $x - \sin x + C$
13. $2(\sin x + x \cos x) + C$
14. $-\frac{1}{\cos x + \sin x} + C$
15. $\frac{1}{6} \sec^3 2x - \frac{1}{2} \sec 2x + C$
16. $\frac{1}{3} \tan^3 x - \tan x + x + C$
17. $\sec x - \operatorname{cosec} x + C$
18. $\tan x + C$
19. $\log |\tan x| + \frac{1}{2} \tan^2 x + C$
20. $\log |\cos x + \sin x| + C$
21. $\frac{\pi x}{2} - \frac{x^2}{2} + C$
22. $\frac{1}{\sin(a-b)} \log \left| \frac{\cos(x-a)}{\cos(x-b)} \right| + C$
23. A
24. B

EXERCISE 7.4

1. $\tan^{-1} x^3 + C$
2. $\frac{1}{2} \log \left| 2x + \sqrt{1+4x^2} \right| + C$

3. $\log \left| \frac{1}{2-x+\sqrt{x^2-4x+5}} \right| + C$
4. $\frac{1}{5} \sin^{-1} \frac{5x}{3} + C$
5. $\frac{3}{2\sqrt{2}} \tan^{-1} \sqrt{2} x^2 + C$
6. $\frac{1}{6} \log \left| \frac{1+x^3}{1-x^3} \right| + C$
7. $\sqrt{x^2-1} - \log \left| x + \sqrt{x^2-1} \right| + C$
8. $\frac{1}{3} \log \left| x^3 + \sqrt{x^6 + a^6} \right| + C$
9. $\log \left| \tan x + \sqrt{\tan^2 x + 4} \right| + C$
10. $\log \left| x+1 + \sqrt{x^2+2x+2} \right| + C$
11. $\frac{1}{6} \tan^{-1} \left(\frac{3x+1}{2} \right) + C$
12. $\sin^{-1} \left(\frac{x+3}{4} \right) + C$
13. $\log \left| x - \frac{3}{2} + \sqrt{x^2-3x+2} \right| + C$
14. $\sin^{-1} \left(\frac{2x-3}{\sqrt{41}} \right) + C$
15. $\log \left| x - \frac{a+b}{2} + \sqrt{(x-a)(x-b)} \right| + C$
16. $2\sqrt{2x^2+x-3} + C$
17. $\sqrt{x^2-1} + 2 \log \left| x + \sqrt{x^2-1} \right| + C$
18. $\frac{5}{6} \log \left| 3x^2 + 2x + 1 \right| - \frac{11}{3\sqrt{2}} \tan^{-1} \left(\frac{3x+1}{\sqrt{2}} \right) + C$
19. $6\sqrt{x^2-9x+20} + 34 \log \left| x - \frac{9}{2} + \sqrt{x^2-9x+20} \right| + C$
20. $-\sqrt{4x-x^2} + 4 \sin^{-1} \left(\frac{x-2}{2} \right) + C$
21. $\sqrt{x^2+2x+3} + \log \left| x+1 + \sqrt{x^2+2x+3} \right| + C$
22. $\frac{1}{2} \log \left| x^2-2x-5 \right| + \frac{2}{\sqrt{6}} \log \left| \frac{x-1-\sqrt{6}}{x-1+\sqrt{6}} \right| + C$

$$23. 5\sqrt{x^2+4x+10} - 7\log|x+2+\sqrt{x^2+4x+10}| + C$$

$$24. B$$

$$25. B$$

EXERCISE 7.5

$$1. \log \frac{(x+2)^2}{|x+1|} + C$$

$$2. \frac{1}{6} \log \left| \frac{x-3}{x+3} \right| + C$$

$$3. \log|x-1| - 5\log|x-2| + 4\log|x-3| + C$$

$$4. \frac{1}{2} \log|x-1| - 2\log|x-2| + \frac{3}{2} \log|x-3| + C$$

$$5. 4\log|x+2| - 2\log|x+1| + C$$

$$6. \frac{x}{2} + \log|x| - \frac{3}{4} \log|1-2x| + C$$

$$7. \frac{1}{2} \log|x-1| - \frac{1}{4} \log(x^2+1) + \frac{1}{2} \tan^{-1} x + C$$

$$8. \frac{2}{9} \log \left| \frac{x-1}{x+2} \right| - \frac{1}{3(x-1)} + C$$

$$9. \frac{1}{2} \log \left| \frac{x+1}{x-1} \right| - \frac{4}{x-1} + C$$

$$10. \frac{5}{2} \log|x+1| - \frac{1}{10} \log|x-1| - \frac{12}{5} \log|2x+3| + C$$

$$11. \frac{5}{3} \log|x+1| - \frac{5}{2} \log|x+2| + \frac{5}{6} \log|x-2| + C$$

$$12. \frac{x^2}{2} + \frac{1}{2} \log|x+1| + \frac{3}{2} \log|x-1| + C$$

$$13. -\log|x-1| + \frac{1}{2} \log(1+x^2) + \tan^{-1} x + C$$

$$14. 3\log|x+2| + \frac{7}{x+2} + C$$

$$15. \frac{1}{4} \log \left| \frac{x-1}{x+1} \right| - \frac{1}{2} \tan^{-1} x + C$$

$$16. \frac{1}{n} \log \left| \frac{x^n}{x^n+1} \right| + C$$

$$17. \log \left| \frac{2-\sin x}{1-\sin x} \right| + C$$

$$18. x + \frac{2}{\sqrt{3}} \tan^{-1} \frac{x}{\sqrt{3}} - 3 \tan^{-1} \frac{x}{2} + C$$

$$19. \frac{1}{2} \log \left(\frac{x^2+1}{x^2+3} \right) + C$$

$$20. \frac{1}{4} \log \left| \frac{x^4 - 1}{x^4} \right| + C$$

$$22. B$$

$$21. \log \left(\frac{e^x - 1}{e^x} \right) + C$$

$$23. A$$

EXERCISE 7.6

$$1. -x \cos x + \sin x + C$$

$$2. -\frac{x}{3} \cos 3x + \frac{1}{9} \sin 3x + C$$

$$3. e^x (x^2 - 2x + 2) + C$$

$$4. \frac{x^2}{2} \log x - \frac{x^2}{4} + C$$

$$5. \frac{x^2}{2} \log 2x - \frac{x^2}{4} + C$$

$$6. \frac{x^3}{3} \log x - \frac{x^3}{9} + C$$

$$7. \frac{1}{4} (2x^2 - 1) \sin^{-1} x + \frac{x\sqrt{1-x^2}}{4} + C$$

$$8. \frac{x^2}{2} \tan^{-1} x - \frac{x}{2} + \frac{1}{2} \tan^{-1} x + C$$

$$9. (2x^2 - 1) \frac{\cos^{-1} x}{4} - \frac{x}{4} \sqrt{1-x^2} + C$$

$$10. (\sin^{-1} x)^2 x + 2\sqrt{1-x^2} \sin^{-1} x - 2x + C$$

$$11. -\sqrt{1-x^2} \cos^{-1} x + x + C$$

$$12. x \tan x + \log |\cos x| + C$$

$$13. x \tan^{-1} x - \frac{1}{2} \log(1+x^2) + C$$

$$14. \frac{x^2}{2} (\log x)^2 - \frac{x^2}{2} \log x + \frac{x^2}{4} + C$$

$$15. \left(\frac{x^3}{3} + x \right) \log x - \frac{x^3}{9} - x + C$$

$$16. e^x \sin x + C$$

$$17. \frac{e^x}{1+x} + C$$

$$18. e^x \tan \frac{x}{2} + C$$

$$19. \frac{e^x}{x} + C$$

$$20. \frac{e^x}{(x-1)^2} + C$$

$$21. \frac{e^{2x}}{5} (2 \sin x - \cos x) + C$$

$$22. 2x \tan^{-1} x - \log(1+x^2) + C$$

$$23. A$$

$$24. B$$

EXERCISE 7.7

1. $\frac{1}{2}x\sqrt{4-x^2} + 2\sin^{-1}\frac{x}{2} + C$
2. $\frac{1}{4}\sin^{-1}2x + \frac{1}{2}x\sqrt{1-4x^2} + C$
3. $\frac{(x+2)}{2}\sqrt{x^2+4x+6} + \log\left|x+2+\sqrt{x^2+4x+6}\right| + C$
4. $\frac{(x+2)}{2}\sqrt{x^2+4x+1} - \frac{3}{2}\log\left|x+2+\sqrt{x^2+4x+1}\right| + C$
5. $\frac{5}{2}\sin^{-1}\left(\frac{x+2}{\sqrt{5}}\right) + \frac{x+2}{2}\sqrt{1-4x-x^2} + C$
6. $\frac{(x+2)}{2}\sqrt{x^2+4x-5} - \frac{9}{2}\log\left|x+2+\sqrt{x^2+4x-5}\right| + C$
7. $\frac{(2x-3)}{4}\sqrt{1+3x-x^2} + \frac{13}{8}\sin^{-1}\left(\frac{2x-3}{\sqrt{13}}\right) + C$
8. $\frac{2x+3}{4}\sqrt{x^2+3x} - \frac{9}{8}\log\left|x+\frac{3}{2}+\sqrt{x^2+3x}\right| + C$
9. $\frac{x}{6}\sqrt{x^2+9} + \frac{3}{2}\log\left|x+\sqrt{x^2+9}\right| + C$
10. A
11. D

EXERCISE 7.8

1. 2
2. $\log\frac{3}{2}$
3. $\frac{64}{3}$
4. $\frac{1}{2}$
5. 0
6. $e^4(e-1)$
7. $\frac{1}{2}\log 2$
8. $\log\left(\frac{\sqrt{2}-1}{2-\sqrt{3}}\right)$
9. $\frac{\pi}{2}$
10. $\frac{\pi}{4}$
11. $\frac{1}{2}\log\frac{3}{2}$
12. $\frac{\pi}{4}$

13. $\frac{1}{2} \log 2$

14. $\frac{1}{5} \log 6 + \frac{3}{\sqrt{5}} \tan^{-1} \sqrt{5}$

15. $\frac{1}{2}(e-1)$

16. $5 - \frac{5}{2} \left(9 \log \frac{5}{4} - \log \frac{3}{2} \right)$

17. $\frac{\pi^4}{1024} + \frac{\pi}{2} + 2$

18. 0

19. $3 \log 2 + \frac{3\pi}{8}$

20. $1 + \frac{4}{\pi} - \frac{2\sqrt{2}}{\pi}$

21. D

22. C

EXERCISE 7.9

1. $\frac{1}{2} \log 2$

2. $\frac{64}{231}$

3. $\frac{\pi}{2} - \log 2$

4. $\frac{16\sqrt{2}}{15}(\sqrt{2}+1)$

5. $\frac{\pi}{4}$

6. $\frac{1}{\sqrt{17}} \log \frac{21+5\sqrt{17}}{4}$

7. $\frac{\pi}{8}$

8. $\frac{e^2(e^2-2)}{4}$

9. D

10. B

EXERCISE 7.10

1. $\frac{\pi}{4}$

2. $\frac{\pi}{4}$

3. $\frac{\pi}{4}$

4. $\frac{\pi}{4}$

5. 29

6. 9

7. $\frac{1}{(n+1)(n+2)}$

8. $\frac{\pi}{8} \log 2$

9. $\frac{16\sqrt{2}}{15}$

10. $\frac{\pi}{2} \log \frac{1}{2}$

11. $\frac{\pi}{2}$

12. π

13. 0

14. 0

15. 0

16. $-\pi \log 2$

17. $\frac{a}{2}$

18. 5

20. C

21. C

MISCELLANEOUS EXERCISE ON CHAPTER 7

$$1. \quad \frac{1}{2} \log \left| \frac{x^2}{1-x^2} \right| + C$$

$$2. \quad \frac{2}{3(a-b)} \left[(x+a)^{\frac{3}{2}} - (x+b)^{\frac{3}{2}} \right] + C$$

$$3. \quad -\frac{2}{a} \sqrt{\frac{(a-x)}{x}} + C$$

$$4. \quad -\left(1 + \frac{1}{x^4}\right)^{\frac{1}{4}} + C$$

$$5. \quad 2\sqrt{x} - 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} - 6\log(1+x^{\frac{1}{6}}) + C$$

$$6. \quad -\frac{1}{2} \log|x+1| + \frac{1}{4} \log(x^2+9) + \frac{3}{2} \tan^{-1} \frac{x}{3} + C$$

$$7. \quad \sin a \log|\sin(x-a)| + x \cos a + C$$

$$8. \quad \frac{x^3}{3} + C$$

$$9. \quad \sin^{-1} \left(\frac{\sin x}{2} \right) + C$$

$$10. \quad -\frac{1}{2} \sin 2x + C$$

$$11. \quad \frac{1}{\sin(a-b)} \log \left| \frac{\cos(x+b)}{\cos(x+a)} \right| + C$$

$$12. \quad \frac{1}{4} \sin^{-1}(x^4) + C$$

$$13. \quad \log \left(\frac{1+e^x}{2+e^x} \right) + C$$

$$14. \quad \frac{1}{3} \tan^{-1} x - \frac{1}{6} \tan^{-1} \frac{x}{2} + C$$

$$15. \quad -\frac{1}{4} \cos^4 x + C$$

$$16. \quad \frac{1}{4} \log(x^4+1) + C$$

$$17. \quad \frac{[f(ax+b)]^{n+1}}{a(n+1)} + C$$

$$18. \quad \frac{-2}{\sin \alpha} \sqrt{\frac{\sin(x+\alpha)}{\sin x}} + C$$

$$19. \quad -2\sqrt{1-x} + \cos^{-1} \sqrt{x} + \sqrt{x-x^2} + C$$

$$20. \quad e^x \tan x + C$$

$$21. \quad -2 \log|x+1| - \frac{1}{x+1} + 3 \log|x+2| + C$$

$$22. \quad \frac{1}{2} \left[x \cos^{-1} x - \sqrt{1-x^2} \right] + C$$

$$23. \quad -\frac{1}{3} \left(1 + \frac{1}{x^2} \right)^{\frac{3}{2}} \left[\log \left(1 + \frac{1}{x^2} \right) - \frac{2}{3} \right] + C$$

24. $e^{\frac{\pi}{2}}$

25. $\frac{\pi}{8}$

26. $\frac{\pi}{6}$

27. $2\sin^{-1}\frac{(\sqrt{3}-1)}{2}$

28. $\frac{4\sqrt{2}}{3}$

29. $\frac{1}{40}\log 9$

30. $\frac{\pi}{2}-1$

31. $\frac{19}{2}$

38. A

39. B

40. D

EXERCISE 8.1

1. 12π

2. 6π

3. A

4. B

Miscellaneous Exercise on Chapter 8

1. (i) $\frac{7}{3}$

(ii) 624.8

2. 9

3. 4

4. D

5. C

EXERCISE 9.1

1. Order 4; Degree not defined

2. Order 1; Degree 1

3. Order 2; Degree 1

4. Order 2; Degree not defined

5. Order 2; Degree 1

6. Order 3; Degree 2

7. Order 3; Degree 1

8. Order 1; Degree 1

9. Order 2; Degree 1

10. Order 2; Degree 1

11. D

12. A

EXERCISE 9.2

11. D

12. D

EXERCISE 9.3

1. $y = 2 \tan \frac{x}{2} - x + C$
2. $y = 2 \sin (x + C)$
3. $y = 1 + Ae^{-x}$
4. $\tan x \tan y = C$
5. $y = \log (e^x + e^{-x}) + C$
6. $\tan^{-1} y = x + \frac{x^3}{3} + C$
7. $y = e^{cx}$
8. $x^{-4} + y^{-4} = C$
9. $y = x \sin^{-1} x + \sqrt{1-x^2} + C$
10. $\tan y = C (1 - e^x)$
11. $y = \frac{1}{4} \log [(x+1)^2 (x^2+1)^3] - \frac{1}{2} \tan^{-1} x + 1$
12. $y = \frac{1}{2} \log \left(\frac{x^2-1}{x^2} \right) - \frac{1}{2} \log \frac{3}{4}$
13. $\cos \left(\frac{y-2}{x} \right) = a$
14. $y = \sec x$
15. $2y - 1 = e^x (\sin x - \cos x)$
16. $y - x + 2 = \log (x^2 (y+2)^2)$
17. $y^2 - x^2 = 4$
18. $(x+4)^2 = y + 3$
19. $(63t+27)^{\frac{1}{3}}$
20. 6.93%
21. Rs 1648
22. $\frac{2 \log 2}{\log \left(\frac{11}{10} \right)}$
23. A

EXERCISE 9.4

1. $(x-y)^2 = Cx e^{\frac{-y}{x}}$
2. $y = x \log |x| + Cx$
3. $\tan^{-1} \left(\frac{y}{x} \right) = \frac{1}{2} \log (x^2 + y^2) + C$
4. $x^2 + y^2 = Cx$
5. $\frac{1}{2\sqrt{2}} \log \left| \frac{x+\sqrt{2}y}{x-\sqrt{2}y} \right| = \log |x| + C$
6. $y + \sqrt{x^2 + y^2} = Cx^2$
7. $xy \cos \left| \frac{y}{x} \right| = C$
8. $x \left[1 - \cos \left(\frac{y}{x} \right) \right] = C \sin \left(\frac{y}{x} \right)$

$$9. \quad cy = \log \left| \frac{y}{x} \right| - 1$$

$$10. \quad ye^{\frac{x}{y}} + x = C$$

$$11. \quad \log(x^2 + y^2) + 2 \tan^{-1} \frac{y}{x} = \frac{\pi}{2} + \log 2$$

$$12. \quad y + 2x = 3x^2 y$$

$$13. \quad \cot\left(\frac{y}{x}\right) = \log|ex|$$

$$14. \quad \cos\left(\frac{y}{x}\right) = \log|ex|$$

$$15. \quad y = \frac{2x}{1 - \log|x|} \quad (x \neq 0, x \neq e)$$

$$16. \quad C$$

$$17. \quad D$$

EXERCISE 9.5

$$1. \quad y = \frac{1}{5} (2\sin x - \cos x) + C e^{-2x}$$

$$2. \quad y = e^{-2x} + C e^{-3x}$$

$$3. \quad xy = \frac{x^4}{4} + C$$

$$4. \quad y(\sec x + \tan x) = \sec x + \tan x - x + C$$

$$5. \quad y = (\tan x - 1) + C e^{-\tan x}$$

$$6. \quad y = \frac{x^2}{16} (4 \log|x| - 1) + C x^{-2}$$

$$7. \quad y \log x = \frac{-2}{x} (1 + \log|x|) + C$$

$$8. \quad y = (1+x)^{-1} \log|\sin x| + C(1+x^2)^{-1}$$

$$9. \quad y = \frac{1}{x} - \cot x + \frac{C}{x \sin x}$$

$$10. \quad (x + y + 1) = C e^y$$

$$11. \quad x = \frac{y^2}{3} + \frac{C}{y}$$

$$12. \quad x = 3y^2 + Cy$$

$$13. \quad y = \cos x - 2 \cos^2 x$$

$$14. \quad y(1+x^2) = \tan^{-1} x - \frac{\pi}{4}$$

$$15. \quad y = 4 \sin^3 x - 2 \sin^2 x$$

$$16. \quad x + y + 1 = e^x$$

$$17. \quad y = 4 - x - 2 e^x$$

$$18. \quad C$$

$$19. \quad D$$

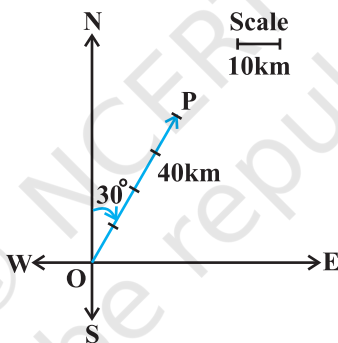
Miscellaneous Exercise on Chapter 9

1. (i) Order 2; Degree 1 (ii) Order 1; Degree 3
 (iii) Order 4; Degree not defined

4. $\sin^{-1}y + \sin^{-1}x = C$ 6. $\cos y = \frac{\sec x}{\sqrt{2}}$
7. $\tan^{-1}y + \tan^{-1}(e^x) = \frac{\pi}{2}$ 8. $e^{\frac{x}{y}} = y + C$
9. $\log|x-y| = x+y+1$ 10. $ye^{2\sqrt{x}} = (2\sqrt{x} + C)$
11. $y \sin x = 2x^2 - \frac{\pi^2}{2} \text{ (} \sin x \neq 0 \text{)}$ 12. $y = \log \left| \frac{2x+1}{x+1} \right|, x \neq -1$
13. C 14. C
15. C

EXERCISE 10.1

1. In the adjoining figure, the vector \overrightarrow{OP} represents the required displacement.



2. (i) scalar (ii) vector (iii) scalar (iv) scalar (v) scalar
(vi) vector
3. (i) scalar (ii) scalar (iii) vector (iv) vector (v) scalar
4. (i) Vectors \vec{a} and \vec{b} are coinitial
(ii) Vectors \vec{b} and \vec{d} are equal
(iii) Vectors \vec{a} and \vec{c} are collinear but not equal
5. (i) True (ii) False (iii) False (iv) False

EXERCISE 10.2

1. $|\vec{a}| = \sqrt{3}, |\vec{b}| = \sqrt{62}, |\vec{c}| = 1$
2. An infinite number of possible answers.

3. An infinite number of possible answers.
4. $x = 2, y = 3$ 5. -7 and 6 ; $-7\hat{i}$ and $6\hat{j}$
6. $-4\hat{j} - \hat{k}$ 7. $\frac{1}{\sqrt{6}}\hat{i} + \frac{1}{\sqrt{6}}\hat{j} + \frac{2}{\sqrt{6}}\hat{k}$
8. $\frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} + \frac{1}{\sqrt{3}}\hat{k}$ 9. $\frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{k}$
10. $\frac{40}{\sqrt{30}}\hat{i} - \frac{8}{\sqrt{30}}\hat{j} + \frac{16}{\sqrt{30}}\hat{k}$ 12. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$
13. $-\frac{1}{3}, -\frac{2}{3}, \frac{2}{3}$ 15. (i) $-\frac{1}{3}\hat{i} + \frac{4}{3}\hat{j} + \frac{1}{3}\hat{k}$ (ii) $-3\hat{i} + 3\hat{k}$
16. $3\hat{i} + 2\hat{j} + \hat{k}$ 18. (C) 19. (B), (C), (D)

EXERCISE 10.3

1. $\frac{\pi}{4}$ 2. $\cos^{-1}\left(\frac{5}{7}\right)$ 3. 0
4. $\frac{60}{\sqrt{114}}$ 6. $\frac{16\sqrt{2}}{3\sqrt{7}}, \frac{2\sqrt{2}}{3\sqrt{7}}$ 7. $6|\vec{a}|^2 + 11\vec{a} \cdot \vec{b} - 35|\vec{b}|^2$
8. $|\vec{a}|=1, |\vec{b}|=1$ 9. $\sqrt{13}$ 10. 8
12. Vector \vec{b} can be any vector 13. $-\frac{3}{2}$
14. Take any two non-zero perpendicular vectors \vec{a} and \vec{b}
15. $\cos^{-1}\left(\frac{10}{\sqrt{102}}\right)$ 18. (D)

EXERCISE 10.4

1. $19\sqrt{2}$ 2. $\pm \frac{2}{3}\hat{i} - \frac{2}{3}\hat{j} - \frac{1}{3}\hat{k}$ 3. $\frac{\pi}{3}; \frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{1}{2}$
5. $3, \frac{27}{2}$ 6. Either $|\vec{a}|=0$ or $|\vec{b}|=0$

8. No; take any two nonzero collinear vectors

9. $\frac{\sqrt{61}}{2}$

10. $15\sqrt{2}$

11. (B)

12. (C)

Miscellaneous Exercise on Chapter 10

1. $\frac{\sqrt{3}}{2}\hat{i} + \frac{1}{2}\hat{j}$

2. $x_2 - x_1, y_2 - y_1, z_2 - z_1; \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$

3. $\frac{-5}{2}\hat{i} + \frac{3\sqrt{3}}{2}\hat{j}$

4. No; take \vec{a} , \vec{b} and \vec{c} to represent the sides of a triangle.

5. $\pm \frac{1}{\sqrt{3}}$

6. $\frac{3}{2}\sqrt{10}\hat{i} + \frac{\sqrt{10}}{2}\hat{j}$

7. $\frac{3}{\sqrt{22}}\hat{i} - \frac{3}{\sqrt{22}}\hat{j} + \frac{2}{\sqrt{22}}\hat{k}$

8. 2 : 3

9. $3\vec{a} + 5\vec{b}$

10. $\frac{1}{7}(3\hat{i} - 6\hat{j} + 2\hat{k}); 11\sqrt{5}$

12. $\frac{1}{3}(160\hat{i} - 5\hat{j} + 70\hat{k})$

13. $\lambda = 1$

16. (B)

17. (D)

18. (C)

19. (B)

EXERCISE 11.1

1. $0, \frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

2. $\pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}, \pm \frac{1}{\sqrt{3}}$

3. $\frac{-9}{11}, \frac{6}{11}, \frac{-2}{11}$

5. $\frac{-2}{\sqrt{17}}, \frac{-2}{\sqrt{17}}, \frac{3}{17}; \frac{-2}{\sqrt{17}}, \frac{-3}{\sqrt{17}}, \frac{-2}{\sqrt{17}}; \frac{4}{\sqrt{42}}, \frac{5}{\sqrt{42}}, \frac{-1}{\sqrt{42}}$

EXERCISE 11.2

4. $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda(3\hat{i} + 2\hat{j} - 2\hat{k})$, where λ is a real number

5. $\vec{r} = 2\hat{i} - \hat{j} + 4\hat{k} + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and cartesian form is

$$\frac{x-2}{1} = \frac{y+1}{2} = \frac{z-4}{-1}$$

$$6. \quad \frac{x+2}{3} = \frac{y-4}{5} = \frac{z+5}{6}$$

$$7. \quad \vec{r} = (5\hat{i} - 4\hat{j} + 6\hat{k}) + \lambda(3\hat{i} + 7\hat{j} + 2\hat{k})$$

$$8. \quad (i) \quad \theta = \cos^{-1}\left(\frac{19}{21}\right) \quad (ii) \quad \theta = \cos^{-1}\left(\frac{8}{5\sqrt{3}}\right)$$

$$9. \quad (i) \quad \theta = \cos^{-1}\left(\frac{26}{9\sqrt{38}}\right) \quad (ii) \quad \theta = \cos^{-1}\left(\frac{2}{3}\right)$$

$$10. \quad p = \frac{70}{11}$$

$$12. \quad \frac{3\sqrt{2}}{2}$$

$$13. \quad 2\sqrt{29}$$

$$14. \quad \frac{3}{\sqrt{19}}$$

$$15. \quad \frac{8}{\sqrt{29}}$$

Miscellaneous Exercise on Chapter 11

$$1. \quad 90^\circ$$

$$2. \quad \frac{x}{1} = \frac{y}{0} = \frac{z}{0}$$

$$3. \quad k = \frac{-10}{7}$$

$$4. \quad 9$$

$$5. \quad \vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$$

EXERCISE 12.1

$$1. \quad \text{Maximum } Z = 16 \text{ at } (0, 4)$$

$$2. \quad \text{Minimum } Z = -12 \text{ at } (4, 0)$$

$$3. \quad \text{Maximum } Z = \frac{235}{19} \text{ at } \left(\frac{20}{19}, \frac{45}{19}\right)$$

$$4. \quad \text{Minimum } Z = 7 \text{ at } \left(\frac{3}{2}, \frac{1}{2}\right)$$

$$5. \quad \text{Maximum } Z = 18 \text{ at } (4, 3)$$

$$6. \quad \text{Minimum } Z = 6 \text{ at all the points on the line segment joining the points } (6, 0) \text{ and } (0, 3).$$

7. Minimum $Z = 300$ at $(60, 0)$;
Maximum $Z = 600$ at all the points on the line segment joining the points $(120, 0)$ and $(60, 30)$.
8. Minimum $Z = 100$ at all the points on the line segment joining the points $(0, 50)$ and $(20, 40)$;
Maximum $Z = 400$ at $(0, 200)$
9. Z has no maximum value
10. No feasible region, hence no maximum value of Z .

EXERCISE 13.1

1. $P(E|F) = \frac{2}{3}$, $P(F|E) = \frac{1}{3}$
2. $P(A|B) = \frac{16}{25}$
3. (i) 0.32 (ii) 0.64 (iii) 0.98
4. $\frac{11}{26}$
5. (i) $\frac{4}{11}$ (ii) $\frac{4}{5}$ (iii) $\frac{2}{3}$
6. (i) $\frac{1}{2}$ (ii) $\frac{3}{7}$ (iii) $\frac{6}{7}$
7. (i) 1 (ii) 0
8. $\frac{1}{6}$ 9. 1 10. (a) $\frac{1}{3}$, (b) $\frac{1}{9}$
11. (i) $\frac{1}{2}, \frac{1}{3}$ (ii) $\frac{1}{2}, \frac{2}{3}$ (iii) $\frac{3}{4}, \frac{1}{4}$
12. (i) $\frac{1}{2}$ (ii) $\frac{1}{3}$ 13. $\frac{5}{9}$
14. $\frac{1}{15}$ 15. 0 16. C 17. D

EXERCISE 13.2

1. $\frac{3}{25}$
2. $\frac{25}{102}$
3. $\frac{44}{91}$
4. A and B are independent
5. A and B are not independent
6. E and F are not independent
7. (i) $p = \frac{1}{10}$ (ii) $p = \frac{1}{5}$
8. (i) 0.12 (ii) 0.58 (iii) 0.3 (iv) 0.4
9. $\frac{3}{8}$
10. A and B are not independent
11. (i) 0.18 (ii) 0.12 (iii) 0.72 (iv) 0.28
12. $\frac{7}{8}$
13. (i) $\frac{16}{81}$, (ii) $\frac{20}{81}$, (iii) $\frac{40}{81}$
14. (i) $\frac{2}{3}$, (ii) $\frac{1}{2}$
15. (i), (ii)
16. (a) $\frac{1}{5}$, (b) $\frac{1}{3}$, (c) $\frac{1}{2}$
17. D
18. B

EXERCISE 13.3

1. $\frac{1}{2}$
2. $\frac{2}{3}$
3. $\frac{9}{13}$
4. $\frac{12}{13}$
5. $\frac{22}{133}$
6. $\frac{4}{9}$
7. $\frac{1}{52}$
8. $\frac{1}{4}$
9. $\frac{2}{9}$
10. $\frac{8}{11}$
11. $\frac{5}{34}$
12. $\frac{11}{50}$
13. A
14. C

Miscellaneous Exercise on Chapter 13

1. (i) 1 (ii) 0
2. (i) $\frac{1}{3}$ (ii) $\frac{1}{2}$
3. $\frac{20}{21}$

$$4. 1 - \sum_{r=7}^{10} {}^{10}C_r (0.9)^r (0.1)^{10-r}$$

$$6. \frac{1}{15}, \frac{2}{5}, \frac{8}{15}$$

$$9. \text{(i) } 0.5 \quad \text{(ii) } 0.05$$

$$11. A$$

$$7. \frac{14}{29}$$

$$12. C$$

$$5. \frac{2}{7}$$

$$8. \frac{3}{16}$$

$$10. \frac{16}{31}$$

$$13. B$$



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Notes

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