

# 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.  $2(\sin x + x \cos \alpha) + C$
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.  $\frac{1}{2} \log |2x + \sqrt{1+4x^2}| + C$

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.  $\sqrt{x^2-1} - \log |x+\sqrt{x^2-1}| + C$
8.  $\frac{1}{3} \log |x^3+\sqrt{x^6+a^6}| + C$
9.  $\log |\tan x + \sqrt{\tan^2 x + 4}| + C$
10.  $\log |x+1+\sqrt{x^2+2x+2}| + C$
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.  $\sqrt{x^2-1} + 2 \log |x+\sqrt{x^2-1}| + C$
18.  $\frac{5}{6} \log |3x^2+2x+1| - \frac{11}{3\sqrt{2}} \tan^{-1} \left( \frac{3x+1}{\sqrt{2}} \right) + C$
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.  $\sqrt{x^2+2x+3} + \log |x+1+\sqrt{x^2+2x+3}| + C$
22.  $\frac{1}{2} \log |x^2-2x-5| + \frac{2}{\sqrt{6}} \log \left| \frac{x-1-\sqrt{6}}{x-1+\sqrt{6}} \right| + C$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

23. A

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

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

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

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

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

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

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

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

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

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

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

## EXERCISE 7.8

1.  $\frac{1}{2}(b^2 - a^2)$
2.  $\frac{35}{2}$
3.  $\frac{19}{3}$
4.  $\frac{27}{2}$
5.  $e - \frac{1}{e}$
6.  $\frac{15+e^8}{2}$

## EXERCISE 7.9

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 7.10

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. A
10. B

### EXERCISE 7.11

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.  $\pi$                       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.  $\frac{1}{2} \log \left| \frac{x^2}{1-x^2} \right| + C$                       2.  $\frac{2}{3(a-b)} \left[ (x+a)^{\frac{3}{2}} - (x+b)^{\frac{3}{2}} \right] + C$   
 3.  $-\frac{2}{a} \sqrt{\frac{(a-x)}{x}} + C$                       4.  $-\left(1 + \frac{1}{x^4}\right)^{\frac{1}{4}} + C$   
 5.  $2\sqrt{x} - 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} - 6 \log(1+x^{\frac{1}{6}}) + C$   
 6.  $-\frac{1}{2} \log|x+1| + \frac{1}{4} \log(x^2+9) + \frac{3}{2} \tan^{-1} \frac{x}{3} + C$   
 7.  $\sin a \log|\sin(x-a)| + x \cos a + C$     8.  $\frac{x^3}{3} + C$   
 9.  $\sin^{-1} \left( \frac{\sin x}{2} \right) + C$                       10.  $-\frac{1}{2} \sin 2x + C$   
 11.  $\frac{1}{\sin(a-b)} \log \left| \frac{\cos(x+b)}{\cos(x+a)} \right| + C$     12.  $\frac{1}{4} \sin^{-1}(x^4) + C$   
 13.  $\log \left( \frac{1+e^x}{2+e^x} \right) + C$                       14.  $\frac{1}{3} \tan^{-1} x - \frac{1}{6} \tan^{-1} \frac{x}{2} + C$   
 15.  $-\frac{1}{4} \cos^4 x + C$                       16.  $\frac{1}{4} \log(x^4+1) + C$   
 17.  $\frac{[f(ax+b)]^{n+1}}{a(n+1)} + C$                       18.  $\frac{-2}{\sin \alpha} \sqrt{\frac{\sin(x+\alpha)}{\sin x}} + C$   
 19.  $\frac{2(2x-1)}{\pi} \sin^{-1} \sqrt{x} + \frac{2\sqrt{x-x^2}}{\pi} - x + C$

$$20. -2\sqrt{1-x} + \cos^{-1}\sqrt{x} + \sqrt{x-x^2} + C$$

$$21. e^x \tan x + C$$

$$22. -2\log|x+1| - \frac{1}{x+1} + 3\log|x+2| + C$$

$$23. \frac{1}{2} \left[ x \cos^{-1} x - \sqrt{1-x^2} \right] + C$$

$$24. -\frac{1}{3} \left( 1 + \frac{1}{x^2} \right)^{\frac{3}{2}} \left[ \log \left( 1 + \frac{1}{x^2} \right) - \frac{2}{3} \right] + C$$

$$25. \frac{\pi}{e^2}$$

$$26. \frac{\pi}{8}$$

$$27. \frac{\pi}{6}$$

$$28. 2\sin^{-1} \frac{(\sqrt{3}-1)}{2}$$

$$29. \frac{4\sqrt{2}}{3}$$

$$30. \frac{1}{40} \log 9$$

$$31. \frac{\pi}{2} - 1$$

$$32. \frac{\pi}{2} (\pi - 2)$$

$$33. \frac{19}{2}$$

$$40. \frac{1}{3} \left( e^2 - \frac{1}{e} \right)$$

$$41. A$$

$$42. B$$

$$43. D$$

$$44. B$$

### EXERCISE 8.1

$$1. \frac{14}{3}$$

$$2. 16 - 4\sqrt{2}$$

$$3. \frac{32 - 8\sqrt{2}}{3}$$

$$4. 12\pi$$

$$5. 6\pi$$

$$6. \frac{\pi}{3}$$

$$7. \frac{a^2}{2} \left( \frac{\pi}{2} - 1 \right)$$

$$8. (4)^{\frac{2}{3}}$$

$$9. \frac{1}{3}$$

$$10. \frac{9}{8}$$

$$11. 8\sqrt{3}$$

$$12. A$$

$$13. B$$