

## Answer Elementary Exercise

1.  $\frac{2^x \cdot e^x}{1 + \ln 2} + C$
2.  $\frac{1}{2}(\tan x + x) + C$
3.  $\frac{1}{2} \sin 2x + C$
4.  $\tan x - x + C$
5.  $\frac{x^3}{3} + C$
6.  $\frac{x^{a+1}}{a+1} + \frac{a^x}{\ln a} + C$
7.  $-(\cot x + \tan x) + C$
8.  $-\frac{1}{x} + \tan^{-1} x + C$
9.  $-\left[\frac{1}{9} \cos 9x + \frac{1}{10} \cos 10x + \frac{1}{11} \cos 11x + \frac{1}{12} \cos 12x\right] + C$
10.  $\sin 2x + C$
11.  $-\frac{\cos 3x}{3} + C$
12.  $\frac{180}{\pi} \sin x^\circ + C$
13.  $\ln x + 2 \tan^{-1} x + C$
14.  $\frac{1}{2} \left[ x - \frac{\ln(2x+1)}{2} \right] + C$
15.  $\tan x - x + C$
16.  $x + C$
17.  $2(\sin x + x \cos x) + C$
18.  $\frac{x^5}{5} - \frac{x^3}{3} + x - 2 \tan^{-1} x + C$
19.  $\sec x - \operatorname{cosec} x + C$
20.  $\frac{1}{2} \left[ \frac{x^3}{3} + \tan^{-1} x \right] + C$
21.  $(\sin x + \cos x) \operatorname{sgn}(\cos x - \sin x) + C$
22.  $\tan x - \cot x - 3x + C$
23.  $\frac{x^2}{2} - x + C$
24.  $-\sqrt{2} \cos \frac{x}{2} + C$
25.  $-\frac{\cos 4x}{8} + C$
26.  $\frac{67}{5}$
27.  $\frac{1}{2}(x - \sin x) + C$
28.  $-2 \cos x + C$
29.  $-\frac{\cos 8x}{8} + C$
30.  $\frac{x}{\sqrt{2}} + C$
31.  $\frac{x^3}{3} + \frac{x^2}{2} + \frac{3x}{2} + \frac{7}{4} \ln(2x+1)$
32.  $\tan x - \tan^{-1} x + C$
33.  $\frac{1}{4} \sin^{-1} \frac{4}{3} x + C$
34.  $\frac{1}{10} \tan^{-1} \frac{2x}{5} + C$
35.  $\frac{2}{3} x + \frac{5}{9} \ln(3x+2) + C$
36.  $\tan x - \sec x + C$
37.  $\frac{\sin 3x}{3} - \frac{\sin 2x}{2} + C$
38.  $-\frac{2}{x} + \tan^{-1} x + C$
39.  $(\sin x - \cos x) + (\sin x + \cos x)x + C$
40.  $C - \frac{2}{x} + \frac{2}{3} \frac{1}{x^3} - \frac{3}{5} \frac{1}{x^5} - 2 \tan^{-1} x$
41.  $-\frac{1}{64} \cos 8x + C$
42.  $x^x + C$

**Answer Ex-I****SINGLE CORRECT (OBJECTIVE QUESTIONS)**

1. A	2. B	3. C	4. A	5. D	6. D	7. B
8. C	9. C	10. A	11. D	12. A	13. C	14. B
15. B	16. A	17. C	18. A	19. C	20. C	21. B
22. C	23. B	24. B	25. C	26. D	27. C	28. D
29. A	30. C	31. A	32. B	33. A	34. B	35. C
36. A	37. C	38. A	39. A	40. B	41. D	42. A
43. B	44. C	45. A	46. A	47. B	48. A	49. B
50. A	51. A	52. B	53. C	54. B	55. B	56. A
57. B	58. C	59. A	60. D			

**Answer Ex-II****MULTIPLE CORRECT (OBJECTIVE QUESTIONS)**

1. C,D	2. A,B	3. B,C,D	4. A,B,C,D	5. A,B	6. B,D	7. A,C,D
8. A,C	9. A,C					

**Answer Ex-III****SUBJECTIVE QUESTIONS**

1. (i)  $-\frac{\cos 2x}{2} + \ln |x+1|$  (ii)  $\frac{1}{3} \ln |\sec(3x+1)| + \frac{1}{4} e^{4x+5} + c$
- (iii)  $\frac{1}{2} \ln |\sec(4x+5)| + c$  (iv)  $\frac{2}{3} (x+2)^{3/2} - 4(x+2)^{1/2} + c$
- (v)  $\frac{x}{2} - \frac{1}{4} \sin 2x + c$  (vi)  $\frac{x}{2} + \frac{1}{4} \sin 2x + c$
- (vii)  $-\frac{1}{10} \cos 5x + \frac{1}{2} \cos x + c$  (viii)  $\frac{1}{2} (e^{3x} + e^{-2x}) + 2x + c$
- (ix)  $\frac{1}{3} e^{3x} + e^{2x} + e^x + c$  (x)  $\frac{2}{3} ((x+3)^{3/2} + (x+2)^{3/2})$
2. (i)  $-\frac{1}{2} \cos x^2 + c$  (ii)  $\frac{1}{2} \ln |x^2+1| + c$
- (iii)  $\frac{1}{2} (\tan x)^2 + c$  (iv)  $\ln |e^x + x| + c$
- (v)  $\ln |x + \cos x| + c$  (vi)  $\frac{1}{2} \ln |e^{2x} - 2|$
- (vii)  $\frac{1}{2} \ln |x^2 + \sin 2x + 2x|$  (viii)  $\ln |\ln(\sec x + \tan x)| + c$
- (ix)  $\frac{2}{15} (a^3 + x^3)^{5/2} - \frac{2a^2}{9} (a^3 + x^3)^{3/2} + c$

3. (i)  $(\sin x)(1 - x) + c$

(ii)  $\frac{x^2}{2} \ln x - \frac{x^2}{4} + c$

(iii)  $\frac{x^2}{4} - \frac{x}{4} \sin 2x - \frac{1}{8} \cos 2x + c$

(iv)  $\frac{x^2}{2} \tan^{-1} x - \frac{x}{2} + \frac{1}{2} \tan^{-1} x + c$

(v)  $x(\ln x - 1) + c$

(vi)  $\frac{\sec x \tan x}{2} + \frac{1}{2} \ln |\sec x + \tan x| + c$

(vii)  $(x^2 - 1)e^{x^2} + c$

(viii)  $x \sin^{-1} \sqrt{x} + \frac{\sqrt{1-x}\sqrt{x}}{2} - \frac{\sin^{-1} \sqrt{x}}{2} + c$

(ix)  $x \tan^{-1} x - \frac{1}{2} \ln(1 + x^2) - \frac{(\tan^{-1} x)^2}{2} + c$

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

(xi)  $e^x \tan x$

4. (i)  $\frac{x}{2} \sqrt{x^2 + 4} + \frac{1}{2} \ln |x + \sqrt{x^2 + 4}| + c$

(ii)  $\frac{1}{2} \tan^{-1} \frac{x}{2} + c$

(iii)  $\ln |x + \sqrt{x^2 - 4}| + c$

(iv)  $\frac{1}{\sqrt{5}} \tan^{-1} \frac{x}{\sqrt{5}} + c$

(v)  $\frac{x+1}{2} \sqrt{x^2 + 2x + 5} + 2 \ln |x + 1 + \sqrt{x^2 + 2x + 5}| + c$

(vi)  $\frac{1}{2} \tan^{-1} \left( \frac{x+1}{2} \right) + c$

(vii)  $-\frac{(1-x-x^2)^{3/2}}{3} - \frac{3}{8} (2x+1) \sqrt{1-x-x^2} - \frac{15}{16} \sin^{-1} \left( \frac{2x+1}{\sqrt{5}} \right) + c$

(viii)  $\ln |x^2 + 3x + 4| - \frac{4}{\sqrt{7}} \tan^{-1} \frac{2x+3}{\sqrt{7}} + c$

(ix)  $-\frac{1}{5} \ln \left| 1 + \frac{1}{x^5} \right| + c$

(x)  $-\frac{1}{4} \left( 1 + \frac{1}{x^5} \right)^{4/5} + c$

(xi)  $\frac{(x^2 - 8)^{3/2}}{24x^3} + c$

(xii)  $x - \arctan x + \frac{1}{2} \ln \frac{\sqrt{1+x^2}}{x} + c$

5. (i)  $\frac{2}{\sqrt{3}} \tan^{-1} \left( \frac{\tan x/2}{\sqrt{3}} \right) + c$

(ii)  $\frac{2}{\sqrt{3}} \tan^{-1} \left( \sqrt{3} \tan \frac{x}{2} \right) + c$

(iii)  $\frac{10}{13} x - \frac{2}{13} \ln |3 \cos x + 2 \sin x| + c$

(iv)  $\ln \left| 1 + 2 \tan \frac{x}{2} \right| + c$

(v)  $\frac{1}{\sqrt{6}} \tan^{-1} \left( \frac{\sqrt{3} \tan x}{\sqrt{2}} \right) + c$

(vi)  $\ln |1 - \cot x| + c$

(vii)  $\tan x + \frac{1}{4} \sin 2x - \frac{3x}{2} + c$

$$6. \quad (i) \frac{1}{2\sqrt{3}} \tan^{-1} \left( \frac{x^2-1}{\sqrt{3}x} \right) - \frac{1}{4} \ln \left| \frac{x+\frac{1}{x}-1}{x+\frac{1}{x}+1} \right| + c \quad (ii) \frac{1}{\sqrt{2}} \tan^{-1} \left( \frac{x^2-1}{\sqrt{2}x} \right) + c$$

$$(iii) -\frac{1}{2\sqrt{3}} \ln \left| \frac{x+\frac{1}{x}-\sqrt{3}}{x+\frac{1}{x}+\sqrt{3}} \right| + c$$

$$7. \quad (i) \ln \left| \frac{\sqrt{x+2}-1}{\sqrt{x+2}+1} \right| + c \quad (ii) \frac{1}{4\sqrt{3}} \ln \left| \frac{t-\sqrt{3}}{t+\sqrt{3}} \right| - \frac{1}{2} \tan^{-1}(t) + C$$

$$(iii) -\frac{1}{\sqrt{3}} \ln \left| \left( t - \frac{1}{3} \right) + \sqrt{\left( t - \frac{1}{3} \right)^2 + \frac{2}{9}} \right| + c \text{ where } t = \frac{1}{x+1}$$

$$(iv) -\tan^{-1} \sqrt{\frac{x^2+2}{x^2}} + c$$

$$8. \quad (i) \ln \left| \frac{x+1}{x+2} \right| + c \quad (ii) \frac{1}{10} \ln |x+3| - \frac{1}{20} \ln |x^2+1| + \frac{3}{10} \tan^{-1} x + c$$

$$(iii) -\ln |x+1| - \frac{1}{(x+1)} + \ln |x+2| + c \quad (iv) \frac{1}{2} \ln |x+1| - \ln |x+2| + \frac{1}{2} \ln |x+3| + c$$

$$9. \quad \frac{1}{8} x - \frac{1}{32} \sin 4x + c$$

$$10. \quad \frac{1}{\cos(a-b)} \ln \left| \frac{\sin(x-a)}{\cos(x-b)} \right| + c$$

$$11. \quad (x+1) + 2\sqrt{x+1} - 2 \ln |x+2| - 2 \tan^{-1} \sqrt{x+1} + c$$

$$12. \quad \frac{1}{\sqrt{3}} \tan^{-1} \left( \frac{x^2-1}{x\sqrt{3}} \right) - \frac{2}{\sqrt{3}} \tan^{-1} \left( \frac{2x^2+1}{\sqrt{3}} \right) + c \quad 13. \quad \operatorname{arcsec} x - \frac{\ln x}{\sqrt{x^2-1}} + c$$

$$14. \quad 2 \ln |\sin^2 \phi - 4 \sin \phi + 5| + 7 \tan^{-1} (\sin \phi - 2) + c$$

$$15. \quad \frac{1}{2\sqrt{2}} \tan^{-1} (\sqrt{2} \tan x) + \frac{1}{2} \tan x + c$$

$$16. \quad \frac{(4+x^2)^{3/2} \cdot (x^2-6)}{120x^5} + c$$

$$17. \quad \ln (x e^{\sin x}) - \frac{1}{2} \ln (1 - x^2 e^{2 \sin x}) + c$$

$$18. \quad \frac{1}{2} [\sin 2x \cdot \ln(1 + \tan x) - x + \ln (\sin x + \cos x)] + c$$

$$19. \quad x \cos \alpha + \sin \alpha \ln \left\{ \frac{\cos \frac{1}{2}(\alpha - x)}{\cos \frac{1}{2}(\alpha + x)} \right\} + c$$

20.  $\frac{1}{2} e^x [(x^2 - 1) \cos x + (x - 1)^2 \cdot \sin x] + c$
21.  $\frac{\sqrt{x^2 + 2x - 3}}{8(x+1)^2} + \frac{1}{16} \cdot \cos^{-1}\left(\frac{2}{x+1}\right) + c$
22.  $e^x \left( \frac{x+1}{x^2+1} \right) + c$
23.  $-\frac{1}{3} \tan x \cdot (2 + \tan^2 x) \cdot \sqrt{4 - \cot^2 x}$
24.  $-2 \cos^4 x \cdot e^{\tan^2 x} + c$
25.  $x \tan^{-1} x \cdot \ln(1 + x^2) + (\tan^{-1} x)^2 - 2x \tan^{-1} x + \ln(1 + x^2) - (\ln \sqrt{1 + x^2})^2 + c$
26.  $e^x \sqrt{\frac{1+x^n}{1-x^n}} + c$
27.  $-\frac{\cos x}{b + a \sin x} + c$
28.  $x; x^2 + 2x \cos \alpha + 1$
29.  $\tan x \ln(1 + \sin^2 x) - 2x + \sqrt{2} \tan^{-1}(\sqrt{2} \cdot \tan x) + c$

**Answer Ex-IV****ADVANCED SUBJECTIVE QUESTIONS**

1.  $\ln\left(\frac{1+3\cos^2 2\theta}{\cos 2\theta}\right) + C$
2.  $\frac{x^5}{x^5 + x + 1} + C$
3.  $\frac{1}{4} \ln(\cos x + \sin x) + \frac{x}{2} + \frac{1}{8}(\sin 2x + \cos 2x) + c$
4.  $2 \tan^{-1}\left(x + \sqrt{x^2 + 2x - 1}\right) + c$
5.  $\left(\frac{x}{e}\right)^x - \left(\frac{e}{x}\right)^x + C$
6.  $\frac{1}{a^2 + b^2} \left( x + \tan^{-1}\left(\frac{a^2 \tan x}{b^2}\right) \right) + C$
7.  $\frac{2x^3}{3} - x - \frac{2}{3}(x^2 - 1)^{3/2} + c$
8.  $\cos a \cdot \arccos\left(\frac{\cos x}{\cos a}\right) - \sin a \cdot \ln(\sin x + \sqrt{\sin^2 x - \sin^2 a}) + c$
9.  $\frac{1}{2} \ln \left| \tan \frac{x}{2} \right| + \frac{1}{4} \sec^2 \frac{x}{2} + \tan \frac{x}{2} + c$
10.  $(a + x) \arctan \sqrt{\frac{x}{a}} - \sqrt{ax} + C$
11.  $\frac{(x^2 + 1)\sqrt{x^2 + 1}}{9x^3} \cdot \left[ 2 - 3 \ln\left(1 + \frac{1}{x^2}\right) \right]$
12.  $\ln\left(\frac{xe^x}{1 + xe^x}\right) + \frac{1}{1 + xe^x} + C$
13. 3
14.  $-\ln(1 - x^4) + c$
15.  $6 \left[ \frac{t^4}{4} - \frac{t^2}{2} + t + \frac{1}{2} \ln(1 + t^2) - \tan^{-1} t \right] + C$  where  $t = x^{1/6}$

$$16. \frac{4}{\sqrt{\cos \frac{x}{2}}} + 2 \tan^{-1} \sqrt{\cos \frac{x}{2}} - \ln \frac{1 + \sqrt{\cos \frac{x}{2}}}{1 - \sqrt{\cos \frac{x}{2}}} + c$$

$$17. C - \ln(1 + (x+1)e^{-x}) - \frac{1}{1 + (x+1)e^{-x}}$$

$$18. \sin^{-1} \left( \frac{1}{2} \sec^2 \frac{x}{2} \right) + c$$

$$19. \frac{1}{24} \ln \frac{(4+3\sin x + 3\cos x)}{(4-3\sin x - 3\cos x)} + c$$

$$20. \frac{1}{2} \left[ \sin x - \cos x - \frac{1}{\sqrt{2}} \ln \tan \left( \frac{x}{2} + \frac{\pi}{8} \right) \right]$$

$$21. \frac{1}{2\sqrt{3}} \ln \frac{\sqrt{3} + \sin x - \cos x}{\sqrt{3} - \sin x + \cos x} + \arctan(\sin x + \cos x) + c$$

$$22. \left[ -\ln(\sec x) - \frac{1}{2} \ln(\sec 2x) + \frac{1}{3} \ln(\sec 3x) \right] + c$$

$$23. 2x - 3 \arctan \left( \tan \frac{x}{2} + 1 \right) + c$$

$$24. C - e^{\cos x} (x + \operatorname{cosec} x)$$

$$25. \sin^{-1} \left( \frac{ax^2 + b}{cx} \right) + k$$

$$26. e^x \sqrt{\frac{1+x}{1-x}} + c$$

$$27. \operatorname{arcsec} x - \frac{\ln x}{\sqrt{x^2 - 1}} + c$$

$$28. \sqrt{3} \ln \frac{t - \sqrt{3}}{1 + \sqrt{3}} + 2 \tan^{-1}(t) + C$$

$$29. 4 \ln x + \frac{7}{x} + 6 \tan^{-1}(x) + \frac{6x}{1+x^2} + C$$

$$30. \frac{\sqrt{2-x-x^2}}{x} + \frac{\sqrt{2}}{4} \ln \left( \frac{4-x+2\sqrt{2}\sqrt{2-x-x^2}}{x} \right) - \sin^{-1} \left( \frac{2x+1}{3} \right) + c$$

$$31. \frac{-2}{\alpha - \beta} \sqrt{\frac{x - \beta}{x - \alpha}} + c$$

$$32. \frac{2}{3} \tan^{-1}(\sin x + \cos x) + \frac{1}{3\sqrt{2}} \ln \left| \frac{\sqrt{2} + \sin x + \cos x}{\sqrt{2} - \sin x - \cos x} \right| + C$$

## Answer Ex-V

## JEE PROBLEMS

$$1. (x+1) \tan^{-1} \frac{2(x+1)}{3} - \frac{3}{4} \ln(4x^2 + 8x + 13) + C$$

$$2. \frac{1}{6(m+1)} (2x^{3m} + 3x^{2m} + 6x^m)^{\frac{m+1}{m}} + C$$

$$3. D \quad 4. (a) A \quad (b) D \quad 5. C \quad 6. C$$