

AREA UNDER THE CURVE

Answer Ex-I

SINGLE CORRECT (OBJECTIVE QUESTIONS)

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|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. C | 2. D | 3. C | 4. C | 5. D | 6. C | 7. B | 8. B |
| 9. A | 10. A | 11. A | 12. B | 13. A | 14. B | 15. C | 16. C |
| 17. B | 18. B | 19. D | 20. A | | | | |

Answer Ex-II

MULTIPLE CORRECT (OBJECTIVE QUESTIONS)

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|--------|-------|-------|--------|------|------|------|--------|
| 1. A,B | 2. B | 3. C | 4. A,C | 5. B | 6. C | 7. D | 8. A,C |
| 9. A,D | 10. B | 11. D | 12. A | | | | |

Answer Ex-III

SUBJECTIVE QUESTIONS

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|---|---|--|--|
| 1. $5/6$ sq. units | 2. $c = -\pi/6$ or $\pi/3$ | 3. $x_0 = 2, A(x_0) = 8$ | 4. $\frac{(e^2 - 5)}{4e}$ sq. units |
| 5. $\pi - \tan^{-1} \frac{2\sqrt{2}}{3\pi}; \pi - \tan^{-1} \frac{4\sqrt{2}}{3\pi}$ | 6. $\frac{11}{8}$ sq. units | 7. $\frac{\pi}{2}; \frac{\pi-1}{\pi+1}$ | 8. $a = 9$ |
| 9. $\frac{3\pi+2}{\pi-2}$ | 10. $\frac{128}{15}$ sq. units | 11. (i) $m = 1$, (ii) $m = \infty$; $A_{\min} = 4/3$ | 12. e |
| 13. 2 sq. units | 14. $a = 3^{1/4}$ | 15. $a = -3/4$ | 16. $\sqrt{3}$ |
| | | | 17. $\frac{1}{3} + \ln\left(\frac{\sqrt{3}}{2}\right)$ sq. units |
| 18. $1 - 3e^{-2}$ | 19. $C = -1$ or $(8 - \sqrt{17})^{1/3}$ | 20. $\frac{5}{4}(5\pi+14)$ sq. units | 21. $\frac{1}{2}(1 - e^{-1/2})$ |

Answer Ex-IV

ADVANCED SUBJECTIVE QUESTIONS

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|--|---|----------------------------------|
| 1. $f(x) = x^2 + 1$; $y = \pm 2x$; $A = \frac{2}{3}$ sq. units | 2. $y = \frac{2x}{3}$ | 3. $\sqrt{2} + 1$ |
| 4. $b = \frac{1}{8}$, $A_{\min} = 4\sqrt{3}$ sq. units | | |
| 5. $f(x) = x \sin x$, $a = 1$; $A_1 = 1 - \sin 1$; $A_2 = \pi - 1 - \sin 1$; $A_3 = (3\pi - 2)$ sq. units | | |
| 6. $\frac{1}{2}$ | 7. $a = 8$ or $\frac{2}{5}(6 - \sqrt{21})$ | 8. $2 - (\pi/2)$ sq. units |
| | 9. $\frac{(\pi-1)}{2}$ | 10. 104 |
| 12. $a = \frac{2}{3}$ | 13. $\alpha = \frac{\pi}{3}$, ratio = $2 : \sqrt{3}$ | 14. $4a^2$ |
| 15. $a = \frac{1}{2}$ gives minima, $A\left(\frac{1}{2}\right) = \frac{3\sqrt{3}-\pi}{12}$; $a = 0$ gives local maxima $A(0) = 1 - \frac{\pi}{4}$; | | |
| $a = 1$ gives maximum value, $A(1) = \frac{\pi}{4}$ | 16. $\left(\frac{16}{9}\right)x^2$ | 17. $e^{\pi/3} \log 2$ sq. units |

Answer Ex-V

JEE PROBLEMS

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|--------------------------------------|--|------------------|-------|--|
| 1. B,D | 2. $\left(\pi - \frac{\pi-2}{2\sqrt{2}}\right)$ sq. units | 3. 9 sq. units | 4. B | 5. $\left(\frac{20}{3} - 4\sqrt{2}\right)$ sq. units |
| 6. B | 7. (a) D; (b) $\frac{1}{3}$ sq. units; (c) $\frac{125}{3}$ sq. units | | | 8. (i) A, (ii) D, (iii) A |
| 9. (a) B, (b) (i) B, (ii) A, (iii) D | 10. B,C,D | 11. B | 12. C | 13. A,B,D |

DIFFERENTIAL EQUATION

Answer Ex-I

SINGLE CORRECT (OBJECTIVE QUESTIONS)

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|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. D | 2. B | 3. C | 4. C | 5. D | 6. B | 7. B | 8. A |
| 9. C | 10. A | 11. B | 12. A | 13. D | 14. A | 15. B | 16. A |
| 17. C | 18. B | 19. A | 20. B | 21. D | 22. B | 23. C | 24. B |

Answer Ex-II

MULTIPLE CORRECT (OBJECTIVE QUESTIONS)

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|----------|-------------|---------|----------|---------|---------|-------|-------|
| 1. A,B,C | 2. C,D | 3. A,B | 4. A,B,D | 5. C | 6. B | 7. A | 8. D |
| 9. A | 10. A | 11. C,D | 12. A | 13. A,D | 14. C,D | 15. C | 16. D |
| 17. A | 18. A,B,C,D | | | | | | |

Answer Ex-III

SUBJECTIVE QUESTIONS

- (i) order 2 & degree 3 (ii) order 2 & degree 2
- $\ell n^2 (\sec x + \tan x) - \ell n^2 (\sec y + \tan y) = c$
- $\sqrt{x^2 - 1} - \sec^{-1} x + \sqrt{y^2 - 1} = c$
- $\ell n \left[1 + \tan \frac{x+y}{2} \right] = x + c$
- (a) $\ell n \left| \tan \frac{y}{4} \right| = c - 2 \sin \frac{x}{2}$, (b) $y = e^{\tan(x/2)}$
- $y = (x+1) \cdot \ell n (x+1) - x + 3$
- (a) $P = 1000 + 1500 e^{-kt}$ where $k = \frac{1}{10} \ell n \left(\frac{5}{3} \right)$; (b) $T = 10 \log_{5/3}(3)$; (c) $P = 1000$ as $t \rightarrow \infty$
- $m = m_0 e^{-kt}$ where $k = -\frac{1}{t_0} \ell n \left(1 - \frac{\alpha}{100} \right)$
- $x^2 + y^2 = k^2$
- $y = \frac{1}{k} \ell n |c(k^2 x^2 - 1)|$
- $y = kx$ or $xy = c$
- (a) $c(x-y)^{2/3} (x^2 + xy + y^2)^{1/6} = \exp \left[\frac{1}{\sqrt{3}} \tan^{-1} \frac{x+2y}{x\sqrt{3}} \right]$ where $\exp x \equiv e^x$, (b) $y^2 - x^2 = c (y^2 + x^2)^2$
- $\frac{y^2 \pm y\sqrt{y^2 - x^2}}{x^2} = \ell n \left| \left(y \pm \sqrt{y^2 - x^2} \right) \cdot \frac{c^2}{x^3} \right|$, where same sign has to be taken
- $x^2 + y^2 - 2x = 0$
- $\frac{1}{2} \ell n |x^2 + a^2| - \tan^{-1} \left(\frac{a}{x} \right) = c$, where $a = x + y^2$
- $xy \cos \frac{y}{x} = c$
- $x^2 + y^2 = cx$
- $\arctan \frac{2y+1}{2x+1} = \ell n c \sqrt{x^2 + y^2 + x + y + \frac{1}{2}}$
- $x + y + \frac{4}{3} = ce^{3(x-2y)}$
- $\frac{1}{2}$
- $y = c(1 - x^2) + \sqrt{1 - x^2}$
- $y = cx^2 \pm x$

27. $y = cx - x^2$ 28. $y = cx + x \ln \tan x$ 29. $x = ce^{-\arctan y} + \arctan y - 1$
30. $y = cx \pm \frac{a^2}{2x}$ 32. $\cos x - 1$ 33. $f(x) = -\frac{2 \cos x}{(1 + \sin x)^2} - Ce^{-\sin x} \cdot \cos x$
34. $27 \frac{7}{9}$ minutes 35. $\frac{dy}{dt} = 4 - \frac{y}{200+t}$ 36. $y^2 + x \ln ax = 0$
37. $\sin y = (e^x + c)(1+x)$ 38. $cx^2 + 2xe^{-y} = 1$ 39. $y = ce^x$; $y = c + \frac{x^2}{2}$
40. $y^2 = -1 + (x+1) \ln \frac{c}{x+1}$ or $x + (x+1) \ln \frac{c}{x+1}$ 41. $e^y = c \cdot \exp(-e^x) + e^x - 1$
42. $y^2 = \frac{2}{3} \sin x + \frac{c}{\sin^2 x}$

Answer Ex-IV**ADVANCED SUBJECTIVE QUESTIONS**

1. $y = 2^{\sin x}$ 2. $y = \frac{1}{3-e}(2e^x - e + 1)$ 3. $f(x) = e^{2x}$
4. (i) $y = u(x) + K(u(x) - v(x))$ where K is any constant; (ii) $\alpha + \beta = 1$; (iii) constant
5. $y = \pm \left[\sqrt{4-x^2} + 2 \ln \frac{2-\sqrt{4-x^2}}{x} \right]$ 6. $xy + \tan^{-1} \frac{y}{x} = c$ 7. $\frac{\sin^{-1} x}{2} + \frac{y}{x-y} = \frac{\pi}{4} - 2$
8. $y^2 = 2x + 1 - e^{2x}$ 9. $f(x) = e^x - \cos x$ 10. $y = \frac{x}{\sqrt{1-x^2}} = ce^{-\frac{x}{\sqrt{1-x^2}}}$
11. $x(x^2 y^2 + \cos xy) = c$ 12. $x(ey + \ln y + 1) = 1$ 13. $y^2 = cx$
14. $y = \pm a \frac{e^{x/a} + e^{-x/a}}{2}$ & $y = \pm a$ 15. $x = e^{2\sqrt{y/x}}$; $x = e^{-2\sqrt{y/x}}$ 16. $T = \log_{4/3} 2$ hrs from the start
17. $y = 5t \left(1 + \frac{50}{50+t} \right)$ gms; $91 \frac{2}{3}$ gms 19. $2y + Kx^3 = cx$
20. (i) $x^2 + 2y^2 = c$, (ii) $\sin y = ce^{-x}$, (iii) $y = cx$ if $k = 2$ and $\frac{1}{x^{k-2}} - \frac{1}{y^{k-2}} = \frac{1}{c^{k-2}}$ if $k \neq 2$
- (iv) $x^2 - y^2 + 2xy = c$; $x^2 - y^2 - 2xy = c$

Answer Ex-V**JEE PROBLEMS**

1. (a) C, (b) A, C, (c) $x^2 + y^2 - 2x = 0$ 2. $y = \ln((x+2y)^2 + 4(x+2y)+2) - \frac{3}{2\sqrt{2}} \ln \left(\frac{x+2y+2-\sqrt{2}}{x+2y+2+\sqrt{2}} \right) + c$
4. $\frac{7\pi \times 10^5}{135\sqrt{g}}$ sec. 5. $y = (x - 2\tan^{-1} x)(1 + x^2)$ 7. (a) $T = H/k$
8. (a) C; (b) $y = x^2 - 2x$, area = $4/3$ sq. units 9. (a) C; (b) A; (c) $\sqrt{1-y^2} + \ln \left| \frac{1-\sqrt{1-y^2}}{y} \right| = \pm x + c$
10. B, C 11. (a) A, (b) C 12. C 13. A, D