

# MISSION NDA MATHEMATICS

## COMPLETE TOPICWISE QUESTIONS

### APPLICATION OF INTEGRATION

- The area common to the circle  $x^2 + y^2 = 16a^2$  and the parabola  $y^2 = 6ax$  is  
(a)  $\frac{4a^2}{3}(4\pi - \sqrt{3})$  sq. units (b)  $\frac{4a^2}{3}(8\pi - 3)$  sq. units  
(c)  $\frac{4a^2}{3}(4\pi + \sqrt{3})$  sq. units (d) none of these
- The area of the region bounded by the curves  $y = |x - 1|$  and  $y = 3 - |x|$  is  
(a) 6 sq. units (b) 2 sq. units  
(c) 3 sq. units (d) 4 sq. units
- $AOB$  is the positive quadrant of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  in which  $OA = a$  and  $OB = b$ . The area between the arc  $AB$  and the chord  $AB$  of the ellipse is  
(a)  $\frac{1}{2}ab(\pi + 2)$  (b)  $\frac{1}{4}ab(\pi - 4)$   
(c)  $\frac{1}{4}ab(\pi - 2)$  (d) none of these
- The area lying in the first quadrant and bounded by the curve  $y = x^3$  and the line  $y = 4x$  is  
(a) 2 (b) 3  
(c) 4 (d) 5
- The area bounded by the curves  $y = |x| - 1$  and  $y = -|x| + 1$  is  
(a) 1 (b) 2  
(c)  $2\sqrt{2}$  (d) 4
- The area bounded by the parabola  $y^2 = x$  and the straight line  $2y = x$  is  
(a)  $\frac{4}{3}$  sq. units (b) 1 sq. unit  
(c)  $\frac{2}{3}$  sq. unit (d)  $\frac{1}{3}$  sq. unit
- The area bounded by the ellipse  $x^2 + 9y^2 = 9$  and the straight line  $x + 3y = 3$  is  
(a)  $3\pi$  (b)  $4\pi$   
(c)  $6\pi$  (d)  $9\pi$
- The area of a loop of the curve  $y^2 = x^2(4 - x^2)$  is  
(a)  $\frac{8}{3}$  (b)  $\frac{16}{3}$   
(c)  $\frac{32}{3}$  (d) none of these
- The area bounded by the curve  $y = x^3$ , the  $x$ -axis and two ordinates  $x = 1$  and  $x = 2$  is  
(a)  $\frac{15}{2}$  sq. units (b)  $\frac{15}{4}$  sq. units  
(c)  $\frac{17}{2}$  sq. units (d)  $\frac{17}{4}$  sq. units



10. If  $A$  is the area between the curve  $y = \sin x$  and the  $x$ -axis in the interval  $[0, \pi/4]$ , then in the same interval, the area between the curve  $y = \cos x$  and the  $x$ -axis is  
 (a)  $A$  (b)  $\pi/2 - A$   
 (c)  $1 - A$  (d) none of these
11. The area of the smaller portion of the circle  $x^2 + y^2 = 4$  cut off by the line  $x = 1$  is  
 (a)  $\frac{4\pi+3\sqrt{3}}{3}$  (b)  $\frac{4\pi-3\sqrt{3}}{3}$   
 (c)  $\frac{2\pi-3\sqrt{3}}{3}$  (d)  $\frac{4\pi-\sqrt{3}}{3}$
12. The area of the smaller segment cut off from the circle  $x^2 + y^2 = 9$  by  $x = 1$  is  
 (a)  $\frac{1}{2}(9\sec^{-1}(3) - \sqrt{x})$  (b)  $9\sec^{-1}(3) - \sqrt{8}$   
 (c)  $\sqrt{8} - 9\sec^{-1}(3)$  (d) none of these
13. The area enclosed by the curve  $xy^2 = 4(2 - x)$  and the  $y$ -axis is  
 (a)  $\pi$  (b)  $2\pi$   
 (c)  $4\pi$  (d)  $\pi/2$
14. The area bounded by lines  $y = 2 + x$ ,  $y = 2 - x$  and  $x = 2$  is  
 (a) 3 (b) 4  
 (c) 8 (d) 16
15. The area bounded by  $y = \cos x$ ,  $x = -\frac{\pi}{2}$ ,  $x = 2\pi$  and the axis of  $x$  in square units is  
 (a) 4 (b) 5  
 (c) 6 (d) 7
16. The area of the figure bounded by the curve  $y = \log x$  and  $y = (\log x)^2$  is  
 (a)  $3 - e$  (b)  $3 + e$   
 (c)  $5 - e$  (d) none of these
17. The area in the first quadrant between  $x^2 + y^2 = \pi^2$  and  $y = \sin x$  is  
 (a)  $\frac{\pi^3-8}{4}$  (b)  $\frac{\pi^3}{4}$   
 (c)  $\frac{\pi^3-16}{4}$  (d)  $\frac{\pi^3-8}{2}$
18. The area bounded by the curves  $y^2 = x^3$  and  $|y| = 2x$  is given by  
 (a) 2 (b)  $32/5$   
 (c)  $32/3$  (d) none of these
19. The area lying between the curves  $y^2 = 4x$  and  $y = 2x$  is equal to  
 (a)  $2/3$  (b)  $1/3$   
 (c)  $35/6$  (d) none of these
20. The area included between the curves  $\sqrt{x} + \sqrt{|y|} = 1$  and  $|x| + |y| = 1$  is  
 (a)  $2/3$  (b)  $1/6$   
 (c)  $4/3$  (d) none of these
21. The area of the figure bounded by  $y = e^x$ ,  $y = e^{-x}$  and the straight line  $x = 1$  is  
 (a)  $e + \frac{1}{e}$  (b)  $e - \frac{1}{e}$   
 (c)  $e + \frac{1}{e} - 2$  (d)  $e + \frac{1}{e} + 2$



22. The area of the region between the curve  $y = 4 - x^2$ ,  $0 \leq x \leq 3$  and the  $x$ -axis is  
 (a)  $16/3$  (b)  $7/3$   
 (c) 3 (d)  $23/3$
23. Ratio of the area cut off from a parabola by any double ordinate is that of the corresponding rectangle contained by that double ordinate and its distance from the vertex is  
 (a) 1: 2 (b) 1: 3  
 (c) 2: 3 (d) 1
24. The area enclosed between the curves  $y = \sqrt{x}$ ,  $x = 2y + 3$  and the  $x$ -axis is  
 (a) 18 (b) 27  
 (c) 9 (d) none of these
25. The positive value of the parameter  $a$  for which the area of the figure bounded by  $y = \sin ax$ ,  $y = 0$ ,  $x = \frac{\pi}{a}$  and  $x = \frac{\pi}{3a}$  is 3 is equal to  
 (a) 2 (b)  $\frac{1}{2}$   
 (c)  $\frac{2+\sqrt{3}}{3}$  (d) none of these
26. The area bounded by the parabola  $y^2 = 4x$  and the line  $x + y = 3$  is  
 (a)  $16/3$  (b)  $32/3$   
 (c)  $64/3$  (d) none of these
27. The equation of the curve whose slope at any point is thrice its abscissa and which passes through  $(-1, -3)$  is  
 (a)  $y = x^2 - 4$  (b)  $3y = 2(x^2 - 4)$   
 (c)  $2y = 3(x^2 - 3)$  (d) none of these
28. The area bounded by the curve  $y = x^2 + 1$  and the straight line  $x + y = 3$  is  
 (a)  $\frac{35}{3}$  (b)  $\frac{9}{2}$   
 (c)  $\frac{32}{3}$  (d)  $\frac{16}{3}$
29. The area bounded by the curve  $|x| + y = 1$  and the  $x$ -axis is  
 (a) 4 (b) 2  
 (c) 1 (d)  $1/2$
30. The area enclosed by the curve  $y = x^2 e^{x^3}$  between the lines  $x = 1$  and  $x = 2$  and the  $x$ -axis is  
 (a)  $\frac{e^2 - e}{3}$  (b)  $\frac{e^8 - e}{3}$   
 (c)  $\frac{e^8 - 1}{3}$  (d)  $\frac{e^7}{3}$
31. The area bounded by the curve  $y = x(x - 1)(x - 2)$  and the  $x$ -axis is equal to  
 (a) 1 (b)  $1/2$   
 (c)  $1/4$  (d) none of these
32. The area bounded by the curve  $xy^2 = a^2(a - x)$  and the  $y$ -axis is  
 (a)  $\pi a^2/2$  (b)  $\pi a^2$   
 (c)  $3\pi a^2$  (d) none of these
33. The area bounded by the curve  $y = \sin^2 x$  and lines  $x = \frac{\pi}{2}$ ,  $x = \pi$  and the  $x$ -axis is  
 (a)  $\frac{\pi}{2}$  sq. units (b)  $\frac{\pi}{4}$  sq. units  
 (c)  $\frac{\pi}{8}$  sq. units (d) none of these



34. The area bounded by the curve  $y = x[x]$ , the  $x$ -axis and the ordinates  $x = 1, x = -1$  is given by  
 (a) 0 (b)  $1/3$   
 (c)  $2/3$  (d) none of these
35. The value of  $c$  for which the area of the figure bounded by the curve  $y = 8x^2 - x^5$ , the straight lines  $x = 1$  and  $x = c$  and the  $x$ -axis is equal to  $16/3$  is  
 (a) 2 (b)  $\sqrt{8 - \sqrt{17}}$   
 (c) 3 (d) none of these
36. If the area cut off from a parabola by any double ordinate is  $k$  times the corresponding rectangle contained by that double ordinate and its distance from the vertex, then  $k$  is  
 (a)  $2/3$  (b)  $1/3$   
 (c)  $3/2$  (d) 3
37. The area of the region bounded by  $x = \frac{1}{2}, x = 2, y = \log x$  and  $y = 2^x$  is  
 (a)  $\frac{3}{2} - \frac{5}{2} \log 2 + \frac{3}{\log 2}$  (b)  $\frac{3}{2} + \frac{5}{2} \log 2 + \frac{3}{\log 2}$   
 (c)  $\frac{3}{2} + \frac{5}{2} \log 2 + \frac{3}{\log 2}$  (d)  $\frac{3}{2} - \frac{5}{2} \log 2 + \frac{3}{\log 2}$
38. The area enclosed by the curve  $\frac{x^2}{25} + \frac{y^2}{16} = 1$  is  
 (a)  $10\pi$  sq. units (b)  $20\pi$  sq. units  
 (c)  $5\pi$  sq. units (d)  $4\pi$  sq. units
39. For which of the following values of  $m$ , is the area of the region bounded by the curve  $y = x - x^2$  and the line  $y = mx$  equal to  $9/2$ ?  
 (a) -4 (b) -2  
 (c) 2 (d) none of these
40. The area of the figure bounded by the straight lines  $x = 0, x = 2$  and the curves  $y = 2^x, y = 2x - x^2$  is  
 (a)  $\left(\frac{4}{\log 2} - \frac{8}{3}\right)$  sq. units (b)  $\left(\frac{4}{\log 2} + \frac{8}{3}\right)$  sq. units  
 (c)  $\left(\frac{8}{\log 3} - \frac{4}{3}\right)$  sq. units (d)  $\left(\frac{3}{\log 2} - \frac{4}{3}\right)$  sq. units
41. The area bounded by the curves  $y^2 = 4a(x + a)$  and  $y^2 = 4b(b - x)$ , where  $a, b > 0$ , is  
 (a)  $\frac{8}{3}(a + b)\sqrt{ab}$  sq. units (b)  $\frac{2}{3}(a + b)\sqrt{ab}$  sq. units  
 (c)  $\frac{2}{3}(a + b)2\sqrt{ab}$  sq. units (d) none of these
42. The area of the region bounded by the curves  $y = |x - 2|, x = 1, x = 3$  and the  $x$ -axis is  
 (a) 3 (b) 2  
 (c) 1 (d) 4
43. The area bounded by the parabolas  $y = 4x^2$  and  $y = \frac{x^2}{9}$  and the line  $y = 2$  is  
 (a)  $\frac{5\sqrt{2}}{3}$  sq. units (b)  $\frac{10\sqrt{2}}{3}$  sq. units  
 (c)  $\frac{15\sqrt{2}}{3}$  sq. units (d)  $\frac{20\sqrt{2}}{3}$  sq. units
44. If the area bounded by the curve  $y^2 = 16x$  and the line  $y = mx$  is  $2/3$ , then  $m$  is equal to  
 (a) 3 (b) 4  
 (c) 1 (d) 2



45. Let  $f(x) = \min\left\{e^x, \frac{3}{2}, 1 + e^{-x}\right\}$   $0 \leq x \leq 1$ . Then the area bounded by  $y = f(x)$ , the  $x$ -axis,  $y$ -axis and the line  $x = 1$  is
- (a)  $\left\{2 - \frac{1}{e} + \frac{3}{2} \log \frac{4}{3} - \log 2\right\}$  sq. units      (b)  $\left\{\frac{1}{e} + \frac{3}{2} \log \frac{4}{3} - \log 2\right\}$  sq. units  
(c)  $\left\{3 - \frac{1}{e} + \frac{3}{2} \log \frac{4}{3} + \log 2\right\}$  sq. units      (d)  $\left\{3 - \frac{2}{e} + \frac{3}{2} \log \frac{3}{4} + \log 2\right\}$  sq. units
46. The area bounded by the curves  $x^2 = 4y$  and  $x = 4y - 2$  is
- (a)  $\frac{9}{8}$  sq. units      (b)  $\frac{9}{4}$  sq. units  
(c)  $\frac{9}{2}$  sq. units      (d) 9 sq. units
47. Let  $f(x) = \begin{cases} \min[(x-1)^2, 2x(1-x)] & \text{if } 0 \leq x \leq 1/2 \\ \min[2x(1-x), x^2] & \text{if } \frac{1}{2} \leq x \leq 1 \end{cases}$  Then the area bounded by the curve and the  $x$ -axis is
- (a)  $\frac{40}{118}$  sq. unit      (b)  $\frac{21}{108}$  sq. unit  
(c)  $\frac{40}{128}$  sq. unit      (d)  $\frac{31}{108}$  sq. unit
48. The area bounded by the curves  $y = f(x)$ ,  $y = x$  and the lines  $x = 1, x = t$  is  $(t + \sqrt{1+t^2}) - \sqrt{2} - 1$  sq. unit for all  $t > 1$ . If  $f(x)$  satisfies  $f(x) > x$  for all  $x > 1$ , then  $f(x)$  is equal to
- (a)  $x + 1 + \frac{x}{\sqrt{1+x^2}}$       (b)  $x + \frac{x}{\sqrt{1+x^2}}$   
(c)  $1 + \frac{x}{\sqrt{1+x^2}}$       (d)  $\frac{x}{\sqrt{1+x^2}}$
49. The area bounded by the curve  $\sqrt{x} + \sqrt{y} = 1$  and the coordinate axes is
- (a) 1      (b) 1/2  
(c) 1/3      (d) 1/6
50. The area of the region bounded by  $y = |x - 1|$  and  $y = 1$  is
- (a) 2      (b) 1  
(c)  $\frac{1}{2}$       (d) none of these

#### ANSWER KEY

- |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c)  | 2. (d)  | 3. (c)  | 4. (c)  | 5. (b)  | 6. (a)  | 7. (a)  | 8. (b)  |
| 9. (b)  | 10. (c) | 11. (b) | 12. (b) | 13. (a) | 14. (b) | 15. (b) | 16. (a) |
| 17. (a) | 18. (a) | 19. (b) | 20. (a) | 21. (c) | 22. (d) | 23. (c) | 24. (c) |
| 25. (b) | 26. (c) | 27. (c) | 28. (b) | 29. (c) | 30. (b) | 31. (b) | 32. (b) |
| 33. (b) | 34. (c) | 35. (d) | 36. (a) | 37. (a) | 38. (b) | 39. (b) | 40. (d) |
| 41. (a) | 42. (c) | 43. (d) | 44. (b) | 45. (a) | 46. (a) | 47. (d) | 48. (a) |
| 49. (d) | 50. (b) |         |         |         |         |         |         |

