

Mathematics 3

1. The value of k for which the points (0,0), (2,0), (0,1) and (0,k) lies on a circle is :  
 (1) 1,2            (2) -1,2            (3) 0,2            (4) 0, 1
  
2. The area of the triangle formed by the tangent and normal at  $(1, \sqrt{2})$  to the circle  $x^2+y^2 = y$  and positive x-axis will be :  
 (1)  $1 \sqrt{3}$         (2)  $4\sqrt{3}$         (3)  $\sqrt{3}$             (4)  $2\sqrt{3}$
  
3. A straight line makes a triangle of area 5 units with the axis of coordinates and is perpendicular to the line  $5x - y = 1$ , the equation of the line is :  
 (1)  $x + 5y \pm 5 = 0$         (2)  $x - 5y \pm 5 \sqrt{2} = 0$   
 (3)  $x + 5y \pm 5 \sqrt{2}$         (4)  $5x + y \pm \sqrt{2} = 0$
  
4. If the points  $(\lambda, 2)$ ,  $(\lambda, 4)$ ,  $(\lambda, \lambda + 1)$  and  $(\lambda, \lambda + 1)$  and  $(\lambda + 4, 16)$  are collinear then the value of  $\lambda$  will be :  
 (1) -4            (2) -5            (3) 4            (4) 5
  
5. The imaginary part of  $\tan^{-1}(5i/3)$  is :  
 (1)  $\log 4$         (2)  $\log 2$         (3)  $\infty$         (4) 0
  
6. If  $x = a + \omega y = a\omega = b\omega$  and  $z = a\omega^2 + b\omega^2$  (where  $\omega$  and  $\omega^2$  are the imaginary cube roots of unity) then the value of  $xyz$  is :  
 (1)  $3ab$         (2)  $a^3 + b^3$         (3)  $a^3 + b^3 + 3ab$         (4)  $a^3 - b^3$
  
7.  $\left[ \frac{\sqrt{3} + i}{2} \right]^6 \left[ \frac{i - \sqrt{3}}{2} \right]^6$  is equal to :  
 (1) -1            (2) 2            (3) -1            (4) 1
  
8. If A is a square matrix their  $A + A^T$  will be :  
 (1) unit matrix  
 (2) symmetric matrix  
 (3) skew symmetric matrix  
 (4) invertible matrix
  
9.  $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$  is equal to :  
 (1)  $4x^2y^2z^2$         (2)  $4xyz$         (3)  $x^2y^2z^2$         (4)  $xyz$

10. The value of  $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$  is :  
 (1) -99      (2) 99      (3) -198      (4) 198
11. If  $(1 + x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$ , then the value of  $C_1 + 2C_2 + 3C_3 + \dots + nC_n$  :  
 (1)  $2^{n-1}$       (2)  $n \cdot 2^{n-1}$       (3)  $2^n$       (4) 0
12. The number of way in which 5 boys and 5 girl can be arranged in line such that not two girls come together will be :  
 (1)  $6 \times 5!$       (2)  $5! \times 4!$       (3)  $5! \times 6!$       (6)  $(5!)^2$
13. If  ${}^nC_{r-1} = 36$ ,  ${}^nC_r = 84$  and  ${}^nC_{r+1} = 216$  then n is equal to :  
 (1) 5      (2) 10      (3) 9      (4) 8
14. If the roots of the equation  $a(b-c)x^2 + b(c-a)x + c(c-b)$  are equal then a, b, c will be :  
 (1) in H.P.      (2) in G.P.      (3) in A.P.      (4) none of these
15. If the 5<sup>th</sup> and 11<sup>th</sup> term of H.P. are  $\frac{1}{45}$  and  $\frac{1}{69}$  respectively then its 16<sup>th</sup> terms is:  
 (1)  $\frac{1}{77}$       (2)  $\frac{1}{81}$       (3)  $\frac{1}{85}$       (4)  $\frac{1}{89}$
16. The sum of the numbers which are divisible by 3 and lies between 250 to 1000 is equal to :  
 (1) 156375      (2) 161575      (3) 136577      (4) 135657
17. If the equations  $x^2 + 9x + q = 0$  and  $x^2 + p'x + q' = 0$  ( $p \neq p'$ ,  $q \neq q'$ ) have one common root then the value of the root will be :  
 (1)  $\frac{q - q'}{p - p'}$  or  $\frac{pq - p'q'}{q - q'}$   
 (2)  $\frac{q - q'}{p' p}$  or  $\frac{pq' - p'q}{q - q'}$   
 (3)  $\frac{pq' - p'q}{q - q'}$   
 (4)  $\frac{q - q'}{p - p'}$
18. If  $x = a(\cos t + \tan t/2)$ ,  $y = a \sin t$ , then the value of  $\frac{dy}{dx}$  at  $t = \frac{\pi}{4}$  is :  
 (1) a      (2) 0      (3) -1      (4) 1

19.  $\frac{d}{dx} \cos^{-1}(\sec x)$  is equal to :

- (1) cosec x      (2) tan x      (3) sec x      (4) sin x

20. The angle of intersection between two curves  $x^2 = 8y$  and  $y^2 = 8x$  at origin will be:

- (1)  $\frac{\pi}{2}$       (2)  $\frac{\pi}{6}$       (3)  $\frac{\pi}{3}$       (4)  $\frac{\pi}{4}$

21. If the function  $2x^3 - (x+5)$  is an increasing function then the value x is :

- (1)  $0 < x < 1$       (2)  $-1 < x < 1$   
 (3)  $x < -1$  and  $x > 1$       (4)  $-1 < x < -\frac{1}{2}$

22. At the point where the function  $\sin^p x \cos^q x$  has maximum value is :

- (1)  $x = \tan^{-1} \sqrt{pq}$       (2)  $x = \tan^{-1} \sqrt{(q/p)}$   
 (3)  $x = \tan^{-1} \sqrt{(p/q)}$       (4)  $x = \tan^{-1} (p/q)$

23. The maximum value of  $\frac{\log x}{x}$  will be :

- (1)  $2/e$       (2)  $2e$       (3)  $1/e$       (4)  $e$

24. The odds against an event is 5 : 2 and in favour of other event is 6 : 5. If the events are independent then the probability that at least one event will happen will be :

- (1)  $\frac{25}{88}$       (2)  $\frac{63}{88}$       (3)  $\frac{52}{77}$       (4)  $\frac{50}{77}$

25. A bag contains 30 balls marked 1 to 30 one ball is drawn at random the probability that the number on the ball is a multiple of 5 or 7 is :

- (1)  $\frac{73}{75}$       (2)  $\frac{2}{3}$       (3)  $\frac{2}{75}$       (4)  $\frac{1}{3}$

26. If  $\mathbf{a} \times \mathbf{b} = \mathbf{b} \times \mathbf{c} \neq \mathbf{0}$  where  $\mathbf{a}, \mathbf{b}, \mathbf{c}$  are coplanar then the correct statement will be :

- (1)  $\mathbf{a} + \mathbf{c} = k\mathbf{a}$       (2)  $\mathbf{a} + \mathbf{c} = k\mathbf{c}$   
 (3)  $\mathbf{a} + \mathbf{c} = k\mathbf{b}$       (4)  $\mathbf{a} + \mathbf{c} = \mathbf{0}$

27. Projection of vector  $2\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$  on the vector  $\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$  will be :

- (1)  $\sqrt{14}$       (2)  $\frac{3}{\sqrt{14}}$       (3)  $\frac{1}{\sqrt{14}}$       (4)  $\frac{2}{\sqrt{14}}$

28.  $\mathbf{i} \times (\mathbf{a} \times \mathbf{i}) + \mathbf{j} \times (\mathbf{a} \times \mathbf{j}) + \mathbf{k} \times (\mathbf{a} \times \mathbf{k})$  is equal to :

- (1)  $-a$       (2)  $a$       (3)  $-2a$       (4)  $2a$

29. The area of the region bounded by the parabola  $y^2 = 4x$  and its latus rectum is :

- (1)  $\frac{5}{3}$       (2)  $\frac{2}{3}$       (3)  $\frac{8}{3}$       (4)  $\frac{4}{3}$

30. The area of the region bounded by the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$  is :

- (1)  $\frac{16}{3} a^2$       (2)  $\frac{32}{3} a^2$       (3)  $\frac{4}{3} a^2$       (4)  $\frac{8}{3} a^2$

31.  $\int_0^{\frac{\pi}{4}} (\sqrt{\tan x} + \sqrt{\cot x}) dx$  is equal to :

- (1)  $2\pi$       (2)  $\frac{\pi}{\sqrt{2}}$       (3)  $\frac{\pi}{2}$       (4)  $\sqrt{2}\pi$

32.  $\int_0^1 \log \sin \left( \frac{\pi x}{2} \right) dx$  is equal to :

- (1)  $-\frac{\pi}{2} \log 2$       (2)  $\frac{\pi}{2} \log 2$   
 (3)  $-\log 2$       (4)  $\log 2$

33.  $\int_0^1 \tan^{-1} x dx$  is equal to :

- (1)  $\frac{\pi}{2} + \log 2$       (2)  $\frac{\pi}{4} - \log \sqrt{2}$   
 (3)  $\frac{\pi}{4} + \frac{1}{2} \log 2$       (4)  $\frac{\pi}{4}$

34.  $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$  is equal to :

- (1)  $\pi + 1$       (2)  $\frac{\pi}{2}$       (3)  $\frac{\pi}{2} + 1$       (4)  $\frac{\pi}{2} - 1$

35.  $\frac{dx}{\sin x + \cos x}$  is equal to :

(1)  $\log \tan \left( \frac{\pi}{8+x} \right) + C$

(2)  $\log \tan \left( \frac{\pi}{2} + \frac{\pi}{8+x} \right) + C$

(3)  $\frac{1}{\sqrt{2}} \log \tan \left( \frac{\pi}{8} + \frac{\pi}{2} \right) + C$

(5) none of these

36.  $e^x \left( \frac{1 + \sin x}{1 + \cos x} \right) dx$  is equal to :

- (1)  $e^x \cot x + C$       (2)  $e^x \tan x C$   
 (3)  $e^x \cot (x/2) + C$       (4)  $e^x \tan (x/2) + C$

37.  $\frac{dx}{2x^2 + x + 1}$  is equal to :

(1)  $\frac{2}{\sqrt{7}} \tan^{-1} \left( \frac{4x + 1}{\sqrt{7}} \right) + C$

(2)  $\frac{1}{2} \tan^{-1} \left( \frac{4x + 1}{\sqrt{7}} \right) + C$

(3)  $\frac{1}{\sqrt{7}} \tan^{-1} \left( \frac{4x + 1}{\sqrt{7}} \right) + C$

(4)  $\frac{1}{2\sqrt{7}} \tan^{-1} \left( \frac{4x + 1}{\sqrt{7}} \right) + C$

38. The two parts of 20 such that the product of the cube of one and the square of the other is maximum is :

- (1) 12,8      (2) 8, 12      (3) 16,4      (4) 10,10

39. The equation of the tangent to the curve  $y = 2 \cos x$  at  $x = \pi/4$  is:

(1)  $y - \sqrt{2} = \sqrt{2} (x - \pi/4)$

(2)  $y + \sqrt{2} = \sqrt{2} (x + \pi/4)$

(3)  $y - \sqrt{2} = 2\sqrt{2} (x - \pi/4)$

—

(4)  $y - \sqrt{2} = \sqrt{2} (x - \pi/4)$

40. If  $u = \tan^{-1} \left\{ \frac{\sqrt{1+x^2}-1}{x} \right\}$  and  $v = 2 \tan^{-1} x$  then  $\frac{du}{dv}$  is equal to :

- (1)  $\frac{1}{4}$                       (2) 1                      (3) 4                      (4) 0

41. If  $y = \tan^{-1} \left( \frac{\cos x}{1 + \sin x} \right)$  then  $dy$  is equal to :

- (1) 0                      (2) 1                      (3)  $-\frac{1}{2}$                       (4)  $\frac{1}{2}$

42. If  $f(x) = |x - 3|$ , then  $f$  is :

- (1) continuous but not differentiable at  $x = 3$   
 (2) differentiable at  $x = 3$   
 (3) not differentiable at  $x = 3$   
 (4) not continuous  $x = 2$

43.  $\lim_{x \rightarrow \infty} x \sin \frac{\pi x}{4x} \cos \frac{\pi x}{4x}$  is equal to :

- (1)  $\frac{\pi}{4}$                       (2)  $\frac{2}{\pi}$                       (3)  $\frac{4}{\pi}$                       (4)  $\frac{\pi}{2}$

44. The equation of the common tangent to the circle  $x^2 + y^2 = 2$  and the parabola  $y^2 = 8x$  will be :

- (1)  $y = x + 2$     (2)  $y = x - 2$     (3)  $y = x + 2$                       (4)  $y = x + 1$

45. The coordinates of the ends of the latus rectum to the parabola  $x^2 = 4ay$  are :

- (1)  $(-2a, a), (2a, a)$                       (2)  $(a, -2a), (2a, a)$   
 (3)  $(-a, 2a), (2a, a)$                       (4)  $(a, 2a), (2a, -a)$

46. If the line  $mx + ny = 1$  is tangent to the parabola  $y^2 = 4ax$  then :

- (1)  $mn = at^2$                       (2)  $mn = an^2$   
 (3)  $mn = am^2$                       (3) none of these

47. If the line  $mx + ny = 1$  is tangent to the circle  $x^2 + y^2 = r^2$  then locus of the point  $(m, n)$  will be :

- (1)  $x^2 + y^2 = 2r^2$                       (3)  $x^2 + y^2 = r^2$   
 (3)  $r^2(x^2 + y^2) = 1$                       (4)  $x^2 + y^2 = 1$

48. If  $3x - 4y + 4 = 0$  and  $6x - 8y - 7 = 0$  are the tangent line of same circle then the radius of the circle will be:

- (1)  $\frac{1}{10}$                       (2)  $\frac{11}{10}$                       (3)  $\frac{3}{4}$                       (4)  $\frac{3}{2}$

49. The angle between the tangent lines to the circle  $(x - 7)^2 + (y + 1)^2 = 25$  will be :

- (1)  $\frac{\pi}{3}$             (2)  $\frac{\pi}{2}$             (3)  $\frac{\pi}{6}$             (4)  $\frac{\pi}{3}$

50. The area of the square formed by the lines  $|x| + |y| = 1$  is:

- (1) 1 square unit            (2) 8 square unit  
(3) 2 square unit            (4) 4 square unit

51. If both the ends of a moving rod of length 1 lines on two perpendicular lines then the locus of the point which divide the rod in the ratio 1 ; 2 is :

- (1)  $9x^2 + 36y^2 = 1^2$             (2)  $9x^2 + 36y^2 = 41^2$   
(3)  $x + \frac{y}{2} = \frac{1}{3}$             (4)  $\frac{x}{2} + y = \frac{1}{3}$

52. The orthocenter of the triangle whose vertices are (0, 0), (3,0) and (0,4) is :

- (1) (2,1)            (2) (-1,0)            (3) (0,1)            (4) 0,0

53. The real part of  $\sin^{-1}(e^{i\theta})$  is :

- (1)  $\sin^{-1}(\sqrt{\cos \theta})$   
(2)  $\cos^{-1}(\sqrt{\sin \theta})$   
(3)  $\sin^{-1}(\sqrt{\sin \theta})$   
(4)  $\sin h^{-1}(\sqrt{\sin \theta})$

54. The argument of  $e^{e^{-i\theta}}$  is :

- (1)  $e^{\sin \theta}$             (2)  $e^{\cos \theta}$             (3)  $-\sin \theta$             (4)  $\sin \theta$

55. If  $\omega$  is the cube root of unity then the value of  $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5$  is :

- (1) 64            (2) 48            (3) 32            (4) 16

56. If  $A = \begin{pmatrix} 3 & 2 \\ 1 & -4 \end{pmatrix}$ , then  $A(\text{adj } A)$  is equal to :

equal to :

- (1)  $-\frac{1}{4}I$             (2) 8I            (3)  $-10A$             (4)  $-14I$

57. If  $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$  then the value of x is :

- (1)  $\frac{11}{3}, 1$             (2)  $\frac{1}{2}, 1$             (3)  $\frac{2}{3}, \frac{11}{3}$             (4)  $0, \frac{1}{3}$

58. If in the expansion of  $(x + a)^n$  the sum of all odd terms is P and the sum of all even terms is Q then the value of  $(P^2 - Q^2)$  will be :

- (1)  $(x^2 - a^2)^n$       (2)  $(x^2 + a^2)^n$       (3)  $(x^2 + a^2)^{2n}$       (4)  $(x^2 - a^2)^{2n}$

59. If  $(1 + x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$  then the value of  $C_0^2 + C_1^2 + \dots + C_n^2$  is :

- (1)  ${}^{2n}C_n$       (2)  ${}^{2n}C_{n-1}$       (3)  ${}^{2n}C_{n+1}$       (4)  ${}^{2n}C_{2n}$

60. The number of total permutations of the letters of the word 'BANANA' are :

- (1) 24      (2) 720      (3) 120      (4) 60

61. How many ways five awards can be distributed among 4 students such that each student can win any number of awards :

- (1) 120      (2) 600      (3) 625      (4) 1024

62. The sum of the infinite terms of  $1 + \frac{4}{5} + \frac{7}{5^2} + \frac{10}{5^3} + \dots$  will be:

- (1)  $\frac{7}{4}$       (2)  $\frac{15}{16}$       (3)  $\frac{16}{35}$       (4)  $\frac{35}{16}$

63. If  $A_1, A_2, G_1, G_2, H_1, H_2$  are the two A.M., G.M. and H.M. between two numbers then  $\frac{A_1 + A_2}{H_1 + H_2} \cdot \frac{H_1 - H_2}{G_1 + G_2}$  is equal to :

- (1) 8      (2) 1      (3) 4      (4) 0

64. If in a G.P. the  $(m + n)$ th term is p and  $(m - n)$ th term is q then its mth term will be:

- (1)  $\sqrt{p/q}$       (2)  $p/q$       (3)  $pq$       (4)  $\sqrt{pq}$

65. The G.M. of the roots of the equation  $x^2 - 18x + y = 0$  will be :

- (1)  $2\sqrt{3}$       (2) 3      (3) 9      (4)  $9\sqrt{2}$

66. If in the expansion of  $(1 + x)^{20}$  the coefficient of the rth and  $(r + 4)$ th term are equal then the value of r will be :

- (1) 10      (2) 9      (3) 8      (4) 7

67. If  $x = \log \tan \left[ \frac{\pi\pi}{4} + \frac{\theta\theta}{2} \right]$  then  $\tanh(x/2)$  will be :



- (1)  $\tan(\theta/2)$       (2)  $-\tan(\theta/2)$       (3)  $-\cot(\theta/2)$       (4)  $\cot(\theta/2)$

**68. If the sum of the distances of variable point to the origin and from the line  $x = 2$  is 4, then the locus of the variable point will be :**

- (1)  $x^2 + 12y = 36$       (2)  $x^2 - 12y = 36$   
 (3)  $y^2 - 12x = 26$       (3)  $y^2 + 12x = 36$

**69. The equation  $ax^2 + bx^2 + 2hxy + 2gx + 2fy + c = 0$  is the equation circle, if :**

- (1)  $ab = h, c = 0$       (2)  $a = b, c = 0$   
 (3)  $a = b \neq 0, h = 0$       (4)  $a = b = 0, h = 1$

**70. The locus of the middle points of the system of chords to the circle  $x^2 + y^2 = 4$  which subtends the right angle at the centre will be :**

- (1)  $x + y = 1$       (2)  $x^2 + y^2 = 2$   
 (3)  $x^2 + y^2 = 1$       (4)  $x + y = 2$

**71. The locus of the middle point of system of the chords to the parabola  $y^2 = 4ax$  which are passing through the origin is :**

- (1)  $x^2 = 4ay$       (2)  $y^2 = 4ax$       (3)  $y^2 = ax$       (4)  $y^2 = 2ax$

**72. The Focus of the parabola  $4y^2 - 6x - 4y = 5$  is:**

- (1)  $\left(-\frac{1}{2}, \frac{1}{2}\right)$       (2)  $\left(\frac{1}{2}, \frac{5}{8}\right)$   
 (3)  $\left(-\frac{5}{8}, \frac{1}{2}\right)$       (4)  $\left(-\frac{8}{5}, 2\right)$

**73. If the line  $2x + y + \lambda = 0$  is normal to the parabola  $y^2 = -8x$  then the value of  $\lambda$  will be :**

- (1) 24      (2) -24      (3) -8      (4) -16

**74. The period of  $\sin^4 x + \cos^4 x$  will be :**

- (1)  $\frac{3\pi}{2}$       (2)  $2\pi$       (3)  $\pi$       (4)  $\frac{\pi}{2}$

**75.  $\lim_{x \rightarrow 1} (1-x) \tan \frac{\pi x}{2}$  is :**

- (1) 0      (2)  $\frac{2}{\pi}$       (3)  $\pi$       (4)  $\frac{\pi}{2}$

**76. A die is thrown two times, the probability that sum of the digits in two throws will be 7 is :**

- (1)  $\frac{8}{36}$       (2)  $\frac{7}{36}$       (3)  $\frac{5}{6}$       (4)  $\frac{1}{6}$

77. The probability that a person can hit a bird is  $\frac{3}{4}$ . He tries 5 times, the probability that he fails all the time is :

- (1)  $\frac{5}{8}$       (2)  $\frac{3}{8}$       (3)  $\frac{23}{24}$       (4)  $\frac{1}{24}$

78. There are four letters to which four different envelopes are available. The probability that all the four letters are placed in wrong envelopes is :

- (1)  $\frac{1023}{1024}$       (2)  $\frac{1}{1024}$       (3)  $\frac{781}{1024}$       (4)  $\frac{243}{1024}$

79. If  $\mathbf{a} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$ ,  $\mathbf{b} = \mathbf{j} + \mathbf{k}$  and  $\mathbf{c} = \mathbf{i} - \mathbf{k}$  then the area of the parallelogram whose diagonals are  $(\mathbf{a} + \mathbf{b})$  and  $(\mathbf{b} + \mathbf{c})$  will be :

- (1)  $\vec{i} + \vec{j} - \vec{k}$       (2)  $\vec{i} - \vec{j} + \vec{k}$

- (3)  $-\vec{i} + \vec{j} + \vec{k}$       (4)  $\vec{i} + \vec{j} + \vec{k}$

80. If  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{c}$  are non coplanar vectors then  $[\mathbf{a} + \mathbf{b}, \mathbf{b} + \mathbf{c}, \mathbf{c} + \mathbf{a}]$  is equal to :

- (1) 0      (2)  $[abc]^2$       (3)  $2[abc]$       (4)  $[abc]$

81. if  $4\mathbf{i} - 3\mathbf{j}$ ,  $\mathbf{i} + 4\mathbf{j} - 3\mathbf{k}$  and  $\mathbf{i} + \mathbf{j} + \mathbf{k}$  are the position vectors of the vertices A, B, C respectively then  $\angle ABC$  is equal to :

- (1)  $\frac{\pi}{2}$       (2)  $\frac{\pi}{3}$       (3)  $\frac{\pi}{4}$       (4)  $\frac{\pi}{6}$

82. The area of the region bounded by the curve  $x^2 + y^2 = 4$ , line  $x = \sqrt{3}y$  and the axis of x is :

- (1)  $\pi$       (2)  $\frac{\pi}{3}$       (3)  $\frac{\pi}{4}$       (4)  $\frac{\pi}{2}$

83.  $\frac{dx}{x(x^4 - 1)}$  is equal to

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

- (3)  $\frac{1}{4} \log \frac{x^4}{x^4 - 1} + C$       (4)  $\log \frac{x^4 - 1}{x^4} + C$

84.  $\frac{dx}{3 + 4 \cos x}$  is equal to :

- (1)  $\frac{1}{\sqrt{7}} \log \left[ \frac{\sqrt{7} - \tan(x/2)}{\sqrt{7} + \tan(x/2)} \right] + C$

$$\sqrt{7} \quad \sqrt{7} + \tan(x/2)$$

$$(2) \frac{1}{\sqrt{7}} \log \left( \frac{\tan(x/2) + \sqrt{7}}{\tan(x/2) - \sqrt{7}} \right) + C$$

$$(3) \frac{1}{\sqrt{7}} \log \left( \frac{\tan(x/2) - \sqrt{7}}{\tan(x/2) + \sqrt{7}} \right) + C$$

$$(4) \frac{1}{\sqrt{7}} \log \left( \frac{\sqrt{7} + \tan(x/2)}{\sqrt{7} - \tan(x/2)} \right) + C$$

85.  $\int x \sin x \, dx$  is equal to :

- (1)  $-x \cos x + \sin x + C$
- (2)  $x \sin x - \cos x + C$
- (3)  $x \cos x + \sin x + C$
- (4)  $x \cos x - \sin x + C$

86.  $\int_{-n}^n \sin x f(\cos x) \, dx$  is equal to :

- (1) 1
- (2) 0
- (3)  $m \int \sin x f(\cos x) \, dx$
- (4) none of these

87.  $\int_0^{\pi/2} x \cot x \, dx$  is equal to :

- (1)  $-\pi \log 2$
- (2)  $\pi \log 2$
- (3)  $\frac{\pi}{2} \log 2$
- (4)  $-\frac{\pi}{2} \log 2$

88.  $\int_{-1}^1 x \tan^{-1} x \, dx$  is equal to :

- (1) 0
- (2)  $\pi - 1$
- (3)  $\frac{\pi}{2} + 1$
- (4)  $\frac{\pi}{2} - 1$

89.  $\int_0^{\pi/2} \log \sin x \, dx$  is equal to :

- (1)  $-\pi \log 2$
- (2)  $-\frac{\pi}{2} \log 2$
- (3)  $\pi \log 2$
- (4)  $\frac{\pi}{2} \log 2$

90. If the roots of the equation  $ix^2 + mx + n = 0$  are in the ratio  $p : q$  then  $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{n}{i}}$  is equal to :

- (1) 0
- (2)  $\frac{n}{q} \frac{n}{1}$
- (3)  $\frac{p+q}{1}$
- (4) none of these

91. If the roots of the equation  $x^2 - 8x + a^2 - 6a = 0$  are real then the value of  $a$  will be:

- (1)  $2 \leq a \leq 8$  (2)  $2 < a < 8$  (3)  $-2 < a < 8$  (4)  $-2 \leq a \leq 8$

92. If  $z_1$  and  $z_2$  are two non zero complex numbers such that  $|z_1 + z_2| = |z_1| + |z_2|$  then  $\text{amp}(z_1) - \text{amp}(z_2)$  is equal to :

- (1)  $\pi/4$  (2)  $-\pi/2$  (3)  $\pi/2$  (4) 0

93. If  $z = x + y iy$  and  $\left| \frac{1 - iz}{z - i} \right| = 1$ , the  $z$  lies on :

- (1) axis of x (2) axis of y (3) circle of radius one (4) none of these

94. The value of  $|z_1 + z_2|^2 + |z_1 - z_2|^2$  :

- (1)  $1 [|z_1|^2 - |z_2|^2]$  (2)  $2 [|z_1|^2 - |z_2|^2]$   
 (3)  $2 [|z_1|^2 + |z_2|^2]$  (4)  $1 [|z_1|^2 + |z_2|^2]$

95. The minimum value of  $|2z - 1| + |3z - 2|$  is :

- (1)  $2/3$  (2)  $1/3$  (3)  $1/2$  (4) 0

96. If  $z = x + iy$  and  $|z| = 1$  ( $z \neq \pm 1$ ) then  $\frac{z - 1}{z + 1}$  is :

- (1) zero (2) purely imaginary (3) purely real (4) not defined

97. If  $x + iy = \sqrt{\frac{a + ib}{c + id}}$ , then  $x^2 + y^2$  is equal to :

- (1)  $\sqrt{\frac{a^2 - b^2}{c^2 - d^2}}$  (2)  $\sqrt{\frac{a^2 - b^2}{c^2 + d^2}}$   
 (3)  $\frac{a^2 + b^2}{c^2 + d^2}$  (4)  $\frac{a^2 - b^2}{c^2 - d^2}$

98. If  $x$  is real then the minimum value of  $\frac{1 - x + x^2}{1 + x + x^2}$  will be :

- (1) 3 (2)  $1/3$  (3) 1 (4) 0

99. If the matrix  $P = \begin{pmatrix} 1 & 2 \\ -3 & 0 \end{pmatrix}$  and  $Q = \begin{pmatrix} -1 & 0 \\ 2 & 3 \end{pmatrix}$  then correct statement is :

- (1)  $P + Q = I$  (2)  $PQ \neq QP$  (3)  $Q^2 = Q$  (4)  $P^2 = P$

100. If the exponential form of the complex number  $-1 = \sqrt{3} e^{i\theta}$  is  $re^{i\theta}$  then  $\theta$  is equal to :

- (1)  $\frac{-4\pi}{3}$  (2)  $\frac{2\pi}{3}$  (3)  $\frac{-2\pi}{3}$  (4)  $\frac{8\pi}{3}$

