Mathematics Blue

1. The lengths of the sub-tangent, ordinate and the sub-normal are in
   a) Arithmetic geometric progression.
   b) A. P
   c) H. P
   d) G. P
2. If $f(x)=\begin{cases}\dfrac{x^2-(a+2)x+a}{x-2}, & x\neq 2\\ 2, & x=2\end{cases}$ is continuous at x=2, then the value of a is
   a) -1
   b) -6
   c) 0
   d) 1
3. The 13th term in the expansion of $\left(x^2+\dfrac{2}{x}\right)^n$ is independent of x, then the sum of the divisors of n is
   a) 39
   b) 36
   c) 37
   d) 38
4. If $a\equiv b(\bmod m)$ and x is an integer then which of the following is correct
   a) $(a\div x)\equiv(b\div x)(\bmod m)$
   b) $(a+x)\equiv(b+x)(\bmod m)$
   c) $(a-x)\equiv(b-x)(\bmod m)$
   d) $ax\equiv bx(\bmod m)$
5. If the straight line $3x+4y=k$ touches the circle $x^2+y^2=16x,$ then the value of k are
   a) 16, -64
   b) 16, 64
   c) -16, -64
   d) -16, 64
6. If α,β,γ are the roots of the equation $x^3+4x+2=0$ then $\alpha^3+\beta^3+\gamma^3=$
   a) -6
   b) 2

c) 6
d) -2

7. The reflection of the point (1, 1) along the line y = -x is
   a) (1, -1)
   b) (0, 0)
   c) (-1, 1)
   d) (-1, -1)

8. The number of real solutions of the equation $\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\frac{\pi}{2}$ is
   a) Infinitely many
   b) one
   c) four
   d) two

9. If $\sin 2x = 4\cos x$, then x=
   a) $2n\pi \pm \frac{\pi}{2}, n \in Z$
   b) $n\frac{\pi}{2} \pm \frac{\pi}{4}, n \in Z$
   c) No value
   d) $n\pi + (-1)^n \frac{\pi}{4}, n \in Z$

10. If $f(x) = \sin(\pi^2)x + \cos(-\pi^2)x$ *then* $f'(x)$ is here (π^2) *and* $(-\pi^2)$ greatest integer functions not greater than its value
    a) -1
    b) $\sin 9x + \cos 9x$
    c) $9\cos 9x - 10\sin 10x$
    d) 0

11. The tangent to the curve $xy = 25$ at any point on it cuts the coordinate axes at A and B, then the area of the triangle OAB is
    a) 100 sq units
    b) 50 sq units
    c) 25 sq units
    d) 75 sq units

12. If $A = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$ *and* $B = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$ *then* $\frac{dA}{dx} =$
    a) 3B+1
    b) 3B
    c) -3B

d) 1-3B

13. If $\vec{a},\vec{b},\vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ then $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}=$
    a) 3/2
    b) -3/2
    c) 2/3
    d) ½
14. The number of real circles cutting orthogonally the circle $x^2+y^2+2x-2y+7=0$ is
    a) 0
    b) 1
    c) 2
    d) Infinitely many
15. The sum of the squares of the eccentricities of the conics $\frac{x^2}{4}+\frac{y^2}{3}=1 and \frac{x^2}{4}-\frac{y^2}{3}=1$ is
    a) 2
    b) $\sqrt{\frac{7}{3}}$
    c) $\sqrt{7}$
    d) $\sqrt{3}$
16. $\cos\left[2\cos^{-1}\frac{1}{5}+\sin^{-1}\frac{1}{5}\right]=$
    a) 1/5
    b) $\frac{-2\sqrt{6}}{5}$
    c) $\frac{-1}{5}$
    d) $\frac{\sqrt{6}}{5}$
17. The general solution of $\sin x-\cos x=\sqrt{2}$ for any integer x is
    a) $2n\pi+\frac{3\pi}{4}$
    b) $n\pi$
    c) $(2n+1)\pi$
    d) $2n\pi$
18. If $x+y=\tan^{-1}y$ and $\frac{d^2y}{dx^2}=f(y)\frac{dy}{dx} then\ f(y)=$
    a) $\frac{-2}{y^3}$

b) $\frac{2}{y^3}$

c) $\frac{1}{y}$

d) $\frac{-1}{y}$

19. If $f(x) = f'(x) + f''(x) + f'''(x) + ...$ and $f(0) = 1 then\ f(x) =$

a) $e^{\frac{x}{2}}$

b) e^{x}

c) e^{2x}

d) e^{4x}

20. If the length of the sub-tangent at any point to the curve $xy^n = a$ is proportional to the abscissa, then 'n' is

a) Any non-zero real number

b) 2

c) -2

d) 1

21. The general solution of the differential equation $\sqrt{1-x^2y^2}\,dx = ydx + xdy$ is

a) $\sin(xy) = x + c$

b) $\sin^{-1}(xy) + x = c$

c) sin(x+c)=xy

d) sin(xy)+x=c

22. If the value of $C_0 + 2C_1 + 3C_2 + ...+ (n+1).C_n = 576$ then n is

a) 7

b) 5

c) 6

d) 9

23. The angle between the lines $\sin^2\alpha.y^2 - 2xy.\cos^2\alpha + (\cos^2\alpha - 1)x^2 = 0$ is

a) 90^0

b) α

c) $\alpha/2$

d) 2α

24. The tangent to the curve $y = x^3 + 1$ at (1,2) makes an angle θ with y axis, then the value of $\tan\theta$ is

a) $\frac{-1}{3}$

b) 3
c) -3
d) 1/3

25. $\int \frac{\sin 2x}{\sin^2 x + 2\cos^2 x} dx$

a) $-\log\left(1+\sin^2 x\right)+c$
b) $\log\left(1+\cos^2 x\right)+c$
c) $-\log\left(1+\cos^2 x\right)+c$
d) $\log\left(1+\tan^2 x\right)+c$

26. For any two real number, an operation * defined by $a*b=1+ab$ is
a) Neither commutative nor associative
b) Commutative but not associative
c) Both commutative and associative
d) Associative but not commutative

27. In a class of 6 students, 25 students play cricket and 20 students play tennis and 10 students play both the games. Then the number of students who play neither is
a) 45
b) 0
c) 25
d) 35

28. If A is 3×4 matrix and B is a matrix such that $A'B$ & BA' are both defined, then B is of the type
a) 4×4
b) 3×4
c) 4×3
d) 3×3

29.If A is a matrix of order 3, such that $A(adjA)=10I$,then $|adjA|$ =
a) 1
b) 10
c) 100
d)10I

30. The local minimum value of the function f given by $f(x)=3+|x|$, $x\in R$ is
a)-1
b)3
c)1
d)0

31. The distance of the point $P(a,b,c)$ from the x-axis is

a) $\sqrt{(a^2+b^2)}$

b) $\sqrt{(b^2+c^2)}$

c) a

d) $\sqrt{(a^2+c^2)}$

32. Lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{k-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar if

a) k=2

b) k=0

c) k=3

d) k=-1

33. A &B are two events such that $P(A)\neq 0, P\,B/A$ if

a) A is subset of B, b) $A\cap B=\phi$ are respectively

i)1,1

ii)0,1

iii)0,0

iv)1,0

34. The value of $\left[\vec{a}-\vec{b}\;\vec{b}-\vec{c}\;\vec{c}-\vec{a}\right]$ is equal to

a)0

b)1

c) $2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

d)2

35. Consider an infinite geometric series with first term ‘a’ and common ratio ‘r’ the sum is 4 and the second term is $\frac{3}{4}$, then

a) a=2,r=$\frac{3}{8}$

b) a=$\frac{4}{7}$,r=$\frac{3}{7}$

c) a=$\frac{3}{2}$,r=$\frac{1}{2}$

d) a=3,r=$\frac{1}{4}$

36. If $f(x)=\begin{cases}\dfrac{3\sin \pi x}{5x}, x\neq 0\\ 2k \quad\quad , x=0\end{cases}$ is continuous at x=0, then the value of k is

a) $\pi/10$

b) $3\pi/10$

c) $3\pi/2$

d) $3\pi/5$

37. $\int_0^{\frac{\pi}{4}} \log\left[\dfrac{\sin x+\cos x}{\cos x}\right]dx$ is equal

a) $\dfrac{\pi}{2}\log 2$

b) log2

c) $\dfrac{\pi}{4}\log 2$

d) $\dfrac{\pi}{8}\log 2$

38. $\int \dfrac{\sin^2 x}{1+\cos x}dx$ is equal to

a) x- sin x +c

b) cos x +c

c) x +sin x +c

d) sin x +c

39. If $\alpha \le 2\sin^{-1}x+\cos^{-1}x \le \beta$ then

a) $\alpha=\dfrac{-\pi}{2}, \beta=\dfrac{3\pi}{2}$

b) $\alpha=0, \quad \beta=2\pi$

c) $\alpha = \frac{-\pi}{2},\ \beta = \frac{\pi}{2}$

d) $\alpha = 0,\ \ \beta = \pi$

40. If A= $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then A^2 is equal to

a) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

41. $\int_{\frac{-\pi}{4}}^{\frac{\pi}{4}} \frac{dx}{1+\cos x}$ is equal to

a) 1

b) 0

c) 2

d) 4

42. The solution of differential equation $x\frac{dy}{dx} + 2y = x^2$ is

a) $y = \frac{x^2}{4} + c$

b) y = $\frac{x^4 + c}{4x^2}$

c) $y = \frac{x^2 + c}{4x^2}$

d) y= $\frac{x^4 + c}{x^2}$

43. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ *and* $|A^3| = 27$ then $\alpha = ?$

a) ± 2

b) $\pm \sqrt{5}$

c) ± 1

d) $\pm \sqrt{7}$

44. Write the set builder form of A=(-1,1)

a) A = $\{x : x \text{ is an Integer}\}$

b) A = $\{x : x \text{ is a root of the equation } x^2 + 1 = 0\}$

d) A = $\{x : x \text{ is a real number}\}$

e) A = $\{x : x \text{ is a root of the equation } x^2 = 1\}$

45. The middle term of the expansion $\left[\frac{10}{x} + \frac{x}{10}\right]$ is

a) $8c_5$

b) $10c_5$

c) $7c_5$

d) $9c_5$

46. If the eccentricity of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ *is* $\frac{5}{4}$ *and* $2x+3y-6=0$ is a focal chord of the hyperbola, then the length of transverse axis is equal to

a) $\frac{24}{5}$

b) $\frac{5}{24}$

c) $\frac{12}{5}$

d) $\frac{6}{5}$

47. $\int \frac{1}{x^2(x^4+1)^{\frac{3}{4}}}dx$ is equal to

a) $\frac{-(1+x^4)^{\frac{1}{4}}}{x^2}+c$

b) $\frac{-(1+x^4)^{\frac{3}{4}}}{x}+c$

c) $\frac{-(1+x^4)^{\frac{1}{4}}}{x}+c$

d) $\frac{-(1+x^4)^{\frac{1}{4}}}{2x}+c$

48. If $F:R\to R$ *is defined by* $f(x)=\frac{x}{x^2+1}$ *find* $f\left(f(z)\right)$

a) $\frac{10}{29}$

b) 29

c) $\frac{1}{29}$

d) $\frac{29}{10}$

49. Evaluate $\begin{vmatrix} \cos 15^0 & \sin 15^0 \\ \sin 75^0 & \cos 75^0 \end{vmatrix}$

a) 0

b) 3

c) 1

d) 2

50. If the angles of elevation of the top of a tower from three collinear points A,B,C on a line leading to the foot of the tower are 35, 45 and 60 degree respectively, then the ratio AB :BC is

a) $1:\sqrt{3}$

b) 2:3

c) $\sqrt{3}:1$

d) $\sqrt{3}:\sqrt{2}$

51. The number of points, having both coordinates as integer, that lie on the interior of the triangle with vertices (0,0) ,(0,41),(41,0) is

a) 820

b) 780

c) 901

d) 861

52. The number of common tangents to the circles
$x^2 + y^2 - 4x - 6y - 12 = 0$ *and* $x^2 + y^2 + 6x + 18y + 26 = 0$ is

a) 3

b) 4

c) 1

d) 2

53. The integral $\int \frac{dx}{x^2(x^4+1)^{\frac{3}{4}}} =$

a) $-(x^4+1)^{\frac{1}{4}}+c$

b) $-\left[\frac{x^4+1}{x^4}\right]^{\frac{1}{4}}+c$

c) $\left[\frac{x^4+1}{x^4}\right]^{\frac{1}{4}}+c$

d) $(x^4+1)^{\frac{1}{4}}+c$

54. Let f(x) be a polynomial of degree four having extreme values at x=1 and x=2 .If $lt_{x\to 0}\left[1+\frac{f(x)}{x^2}\right]=3$ then f(2) is equal to

a) 0

b) 4

c) -8

d) -4

55) The area (in sq units) of the quadrilateral formed by the tangents at the end points of the lotus rectum of the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$ is

a) $\frac{27}{2}$

b) 27

c) $\frac{27}{4}$

d) 18

56. Given two numbers a and b. Let A denote the single A.M and S denote the sum of n A.M's between a and b then S/A depends on

a) n, a, b

b) n, b

c) n, a

d) n

57. If $S = \sum_{n=2}^{\infty} \frac{nc_2}{(n+1)!}$ then S equals

a) e-2

b) e +2

c) 2e

d) $\frac{e}{2} - 1$

58. In any discrete series the relationship between MD about mean and SD is

a) MD=SD

b) MD≥SD

c) MD $\prec$ SD

d) MD ≤SD

59. There are two women's participating in a chess tournament Every participant played 2 games with the other participants. The number of games the men played between themselves proved to exceed by 66 the number of games that the men played with the women . The number of participants is

a) 6

b) 11

c) 13

d) None of these

60. If x €R then $\frac{x^2 - x + 1}{x^2 + x + 1}$ takes value in the interval

a) $\left(\frac{1}{3}, 3\right)$

b) $\left[\frac{1}{3}, 3\right]$

c) (0,3)

d) none of these .

BLUE ANSWERS

1	d
2	c
3	a
4	a
5	d
6	a
7	d
8	d
9	a
10	c
11	b
12	b
13	b
14	a
15	a
16	b
17	a
18	b
19	a
20	a
21	c
22	a
23	a
24	d
25	c

26 b
27 c
28 b
29 c
30 (a,c)
31 b
32 b
33 d
34 a
35 d
36 b
37 d
38 a
39 d
40 d
41 a
42 b
43 d
44 d
45 b
46 a
47 c
48 a
49 a
50 c
51 b
52 a
53 b
54 a
55 b
56 d
57 d
58 d
59 c
60 b