Sample Paper

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Maths

Q.No. 1 $\int \frac{x^2-1}{x^4+3x^2+1}$ dr $(x>0)$ is

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

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

(C) loy $\left|\frac{x+\frac{1}{x}-1}{x+\frac{1}{x}+1}\right|+c$

(D) $\log_v\left|\frac{x-\frac{1}{x}-1}{x-\frac{1}{x}+1}\right|+c$

Q.No. 2 Let A (2, -3) and B(- 1) be two angular points of △ABC. If the centroid of the triangle moves on the line 2x + 3y = 1. then the locus of the angular point C is given by

(A) 2x + 3y =9

(B) 2x - 3y = 9

(C) 3x- 2y = 5

(D) 3x - 2y = 3

Q.No. 3 $\int_0^{100} e^{x-1x1}dx =$

(A) $\frac{e^{100}-1}{100}$

(B) $\frac{e^{100}-1}{c-1}$

(C) $100(e-1)$

(D) $\frac{e-1}{100}$

Q.No. 4 Let P $\left(\mathrm{at}^2, 2\mathrm{at}\right)$, Q, R $\left(\mathrm{ar}^2, 2\mathrm{ar}\right)$ be three points on a parabola $y^2=4ax$ .If PQ is the focal chord and PK. QR are parallel where the co-ordinates of K is (2a, 0), then the value of r is

(A) $\frac{t}{1-t^2}$

(B) $\frac{1-t^2}{t}$

(C) $\frac{t^2+1}{t}$

(D) $\frac{t^2-1}{t}$

Q.No. 5 B is an extremity of the minor axis of an ellipse whose foci are S and S', If a ∠SBS' is a right angle, then the eccentricity of the ellipse is

(A) 1/2

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(B) 1/√2

(C) 2/3

(D) 1/3

Q.No. 6 Three lines are drawn from the origin O with direction cosines proportional to (1,-1.1). (2, -3, 0) and (1, 0, 3). The three lines are

(A) not coplanar

(B) coplanar

(C) perpendicular to each other

(D) coincident

Q.No. 7 In a GP. series consisting of positive terms, cach term is equal to the sum of next two terms. Then the common ratio of this G.P series is

(A) √5

(B) $\frac{\sqrt{5}}{2}$

(C) $\frac{\sqrt{5}-1}{2}$

(D) $\frac{\sqrt{5}+1}{2}$

Q.No. 8 $\int \cos(\log x)dx = F(x) + c$ where c is an arbitrary constant .Here F(x) =

(A) $x[\cos(\log x) + \sin(\log x)]$

(B) $x[\cos(\log x) - \sin(\log x)]$

(C) $\frac{x}{2}[\cos(\log x) + \sin(\log x)]$

(D) $\frac{x}{2}[\cos(\log x) - \sin(\log x)]$

Q.No. 9 $\int \cos(\log x)\mathrm{d}v = \mathrm{F}(x) + \mathrm{c}$ where c is an arbitrary constant, Here F(x) =

(A) x[cos(log x) + sin(log x)]

(B) x[(cos(log x) - sin(log x)]

(C) x[(cos(log x) + sin(log x)]

(D) x/2[(cos(log x) - sin(log x)]

Q.No. 10 If the sum of two unit vectors is a unit vector, then the magnitude of their difference is

(A) √2 units

(B) 2 units

(C) √3 units

(D) √5 units

Q.No. 11 The approximate value of sin 31° is

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(A) > 0.5

(B) > 0.6

(C) < 0.5

(D) < 0.4

Q.No. 12 The integrating factor of the first order differential equation
$x^2\left(x^2-1\right)\frac{dy}{dx}+x\left(x^2+1\right)y=x^2-1$ is

(A) e^x

(B) x - 1/x

(C) x + 1/x

(D) $\frac{1}{x^2}$

Q.No. 13 The probability that a non leap year selected at random will have 53 Sundays is

(A) 0

(B) 1/7

(C) 2/7

(D) 3/7

Q.No. 14 The area of the region lying above x-axis. and included between the circle $x^2+y^2=2ax$ & the parabola $y^2 = ax, a > 0$ is

(A) $8\pi a^2$

(B) $a^2\left(\frac{\pi}{4}-\frac{2}{3}\right)$

(C) $\frac{16\pi a^2}{9}$

(D) $\pi\left(\frac{27}{8}+3a^2\right)$

Q.No. 15 Let f: $[: |a, b| \to \mathbb{R}$ be differentiable on [a, b]&k $\in \mathbb{R}$ .Let $f(a) = 0 = f(b)$ Also let
$J(x) = f'(x) + kf(x)$ Then

(A) $J(x) > 0$ for all $x \in [a, b]$

(B) $J(x) < 0$ for all $x \in [a, b]$

(C) $J(x) - 0$ for all $x \in [a, b]$

(D) $J(x) = 0$ through (a, b)

Q.No. 16 Let $\vec{\alpha}, \vec{\beta}, \vec{\gamma}$ be three unit vectors such that $\vec{\alpha} \cdot \vec{\beta} = \vec{\alpha} \cdot \vec{\gamma} = 0$ and the angle between $\vec{\beta}$ and $\vec{\gamma}$ is 30° .Then $\vec{\alpha}$ is _____

(A) $2(\vec{\beta} \times \vec{\gamma})$

(B) $-2(\vec{\beta} \times \vec{\gamma})$

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(C) $\pm 2(\vec{\beta} \times \vec{\gamma})$

(D) $(\vec{\beta} \times \vec{\gamma})$

Q.No. 17 If z_1 and z_2 be two non zero complex numbers such that $\frac{z_1}{z_2} + \frac{z_2}{z_1} = 1$ then,the origin and the points represented by z_1 and z_2

(A) lie on a straight line

(B) form an right angled triangle

(C) form an equilateral triangle

(D) form an isosceles triangle

Q.No. 18 The locus of the mid-points of the chords of the circle $x^2 + y^2 + 2x - 2y - 2 = 0$ which make an angle of 90° at the centre is

(A) $x^2 + y^2 - 2x - 2y = 0$

(B) $x^2 + y^2 - 2x + 2y = 0$

(C) $x^2 + y^2 + 2x - 2y = 0$

(D) $x^2 + y^2 + 2x - 2y - 1 = 6$

Q.No. 19 If $\mathbf{f} : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = e^x$ and g : R → R defined by $g(x) = x^2$. The mapping g ∘ f : $\mathbb{R} \to \mathbb{B}$ be defined by $(g \circ f)(x) = g[f(x)] \forall x \in \mathbb{R}$. Then

(A) g ∘ f is bijective but f is not injective

(B) g ∘ f is injective and g is injective

(C) g ∘ f is injective but g is not bijective

(D) g ∘ f is surjective and g is surjective

Q.No. 20 Let $f(x) = x^{13} + x^{11} + x^9 + x^7 + x^5 + x^3 + x +$ Then f(x) = 0 has

(A) 13 real roots

(B) only one positive and only two negative real roots

(C) not more than one real root

(D) has two positive and one negative real root

Q.No. 21 The normals to the curve $y = x^2 - x + 1$,drawn at the points with the abscissa $x_1 = 0, x_2 = -1$ and $x_3 - \frac{5}{2}$

(A) are parallel to each Other

(B) are pairwise perpendicular

(C) are concurrent

(D) are not concurrent

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Q.No. 22 The greatest integer which divides (p + 1) (p + 2) (p + 3)... (p + q) for all p∈ H and fixed q∈H is

(A) p!

(B) q!

(C) p

(D) q

Q.No. 23 The point Q is the image of the P(1,5) about the line y x and R is the image of the point Q about the line $y = -x$ The circumcenter of the ΔPQR is

(A) $(5, 1)$

(B) $(-5, 1)$

(C) $(1, -5)$

(D) $(0, 0)$

Q.No. 24 The number of selection of n objects from 2n objects of which n are identical and the rest are different is

(A) 2^n

(B) 2^{n-1}

(C) $2^n - 1$

(D) $2^{n-1} + 1$

Q.No. 25 Without changing the direction of the the origin is to the point (2. 3). Then the equation $x^2 + y^2 - 4x - 6y + 9 = 0$ changes to

(A) $x^2 + y^2 + 4 = 0$

(B) $x^2 + y^2 = 4$

(C) $x^2 + y^2 - 8x - 12y + 48 = 0$

(D) $x^2 + y^2 = 9$

Q.No. 26 Consider the function $y = \log_a \left(x + \sqrt{x^2 + 1}\right), a > 0, a \neq 1$ .The inverse of the function

(A) does not exist

(B) is $x = \log_{1/2} \left(y + \sqrt{y^2 + 1}\right)$

(C) is $x = \sinh(y/n \text{ a })$

(D) is $x = \cosh\left(-y \ln \frac{1}{a}\right)$

Q.No. 27 The value of the integral $\int_0^1 e^{x^2} dx$

(A) is less than 1

(B) is greater than 1

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(C) is less than or equal to 1

(D) lies in the closed interval [1, e]

Q.No. 28 Transforming to parallel axes through a point (p,q), the equation $2x^2 + 3xy + 4y^2 + x + 18y + 25 = 0$ becomes $2x^2 + 3xy + 4y^2 =$ Then

(A) p = -2, q= 3

(B) p = 2, q= -3

(C) p = 3, q= -4

(D) p= -4, q= 3

Q.No. 29 Let $\vec{\alpha} = \hat{\mathrm{i}} + \hat{\mathrm{j}} + \hat{\mathrm{k}}, \vec{\beta} = \hat{\mathrm{i}} - \hat{\mathrm{j}} - \hat{\mathrm{k}}$ and $\vec{y} = \hat{i} + \hat{\jmath} - \hat{k}$ be three vectors A vector $\vec{\delta}$ in the plane of $\vec{\alpha}$ and $\vec{\beta}$ projections on $\vec{\gamma}$ Is $\frac{1}{\sqrt{3}}$ given by

(A) $-\hat{i} - 3\hat{j} - 3\hat{k}$

(B) $\hat{\mathrm{i}} - 3\hat{\mathrm{j}} - 3\hat{\mathrm{k}}$

(C) $-\hat{i} + 3\hat{j} + 3\hat{k}$

(D) $\hat{\mathbf{i}} + 3\hat{\mathbf{j}} - 3\hat{\mathbf{k}}$

Q.No. 30 Out of 7 consonants and 4 vowels. words are formed each having 3 consonants and 2 vowels. The number of such words that can be formed is

(A) 210

(B) 25200

(C) 2520

(D) 302400

Q.No. 31 Number of common tangents of $y = x^2$ and $-x^2+4x-4$ is

(A) 1

(B) 2

(C) 3

(D) 4

Q.No. 32 The value of K in order that f(x) = sin x - cos x - Kx + 5 decreases for all positive real values of x is given by

(A) K < I

(B) K ≥ I

(C) K > √2

(D) K < √2

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Q.No. 33 If $(2 \leq r \leq n)$ then ${}^{n}C_{r} + 2.{}^{n}C_{r+1} + {}^{n}C_{r12}$ is equal to

(A) $2.{}^{n}C_{r+2}$

(B) ${}^{n+1}C_{r+1}$

(C) $\mathrm{n}^{-2}\mathrm{C}_{\mathrm{r}+2}$

(D) ${}^{n+1}C_{r}$

Q.No. 34 Let P be the set of all non-singular matrices of order 3 over R and Q be the set of all orthogonal matrices of order 3 over R. Then

(A) P is proper subset of Q

(B) Q is proper subset of P

(C) Neither P is proper subset of Q nor Q is proper subset of P

(D) P∩Q = Φ. the void set

Q.No. 35 Let ρ be a relation defined on N the set of the natural numbers as
$\rho = \{(x, y) \in \mathbb{N} \times N : 2x + y = 41\}$ then

(A) ρ is an equivalence relation

(B) ρ is only reflexive relation

(C) ρ is only symmetric relation

(D) ρ is not transitive

Q.No. 36 If p, q are odd integers. then the roots of the equation $2px^2 + (2p + q)\, x + q = 0$ are

(A) rational

(B) irrational

(C) non-real

(D) equal

Q.No. 37 Let A, B be two distinct points on the parabola $y^2 = 4x$ If the axis of the parabola touches a circle Of radius r having AB as diameter, the slope Of the line AB is

(A) $\frac{1}{r}$

(B) $\frac{1}{r}$

(C) $\frac{2}{r}$

(D) $-\frac{2}{r}$

Q.No. 38 If one of the diameters Of the given by the equation $x^2 + y^2 + 4x + 6y - 12 = 0$ is a chord of a circle S, whose centre is (2,-3) the radius of S is

(A) $\sqrt{41}$ units

(B) $3\sqrt{5}$ units

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(C) $5\sqrt{2}$ units

(D) $2\sqrt{5}$ units

Q.No. 39 Let f: KR —> R be such that f is injective and f(x) f(y) = f(x+ y) for all x, y ∈ R. If f(x), f(y), f(z) are in G.P. then x, y, z are in

(A) A.P always

(B) GP always

(C) AP depending on the value of x.y, z

(D) G.P depending on the value of x. y, z

Q.No. 40 The value of det A. where $A = \begin{pmatrix} 1 & \cos\theta & 0 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{pmatrix}$ lies

(A) in the closed interval [1, 2]

(B) in the closed interval [0, 1]

(C) in the open interval (0, 1)

(D) in the open interval (1, 2)

Answer Sheet

Q.No	Answer
Q.No. 1	(C)
Q.No. 2	(A)
Q.No. 3	(C)
Q.No. 4	(D)
Q.No. 5	(B)
Q.No. 6	(B)
Q.No. 7	(B)
Q.No. 8	(C)
Q.No. 9	(C)
Q.No. 10	(C)
Q.No. 11	(A)
Q.No. 12	(B)
Q.No. 13	(B)
Q.No. 14	(B)
Q.No. 15	(C)
Q.No. 16	(C)
Q.No. 17	(C)

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Q.No. 18	(C)
Q.No. 19	(C)
Q.No. 20	(C)
Q.No. 21	(C)
Q.No. 22	(B)
Q.No. 23	(D)
Q.No. 24	(A)
Q.No. 25	(B)
Q.No. 26	(C)
Q.No. 27	(B)
Q.No. 28	(B)
Q.No. 29	(C)
Q.No. 30	(B)
Q.No. 31	(B)
Q.No. 32	(C)
Q.No. 33	(C)
Q.No. 34	(B)
Q.No. 35	(D)
Q.No. 36	(A)
Q.No. 37	(C)
Q.No. 38	(A)
Q.No. 39	(A)
Q.No. 40	(A)

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