# IIT-JEE-Mathematics-Paper2-2008

---

**1.** A particle P starts from the point $z_0 = 1 + 2i$, where i = ?(-1). It moves first horizontally away from origin by 5 units and then vertically away from origin by 3 units to reach a point $z_1$ the particles moves ?2 units in the direction of the unit vector i + j and then it moves through an angle Π/2 in anticlockwise direction on a circle with centre at origin, to reach a point $z_2$. The point $z_2$ is given by

(A) 6 + 7i

(B) -7 + 6i

(C) 7 + 6i

(D) -6 + 7i

**2.** Let the function g : (-? , ? ) -->( -Π/2 , Π/2) be given by g(u) = $2\tan^{-1}(e^u)$ -Π/2. Then, g is

(A) even and is strictly increasing in (0, ? )

(B) odd and is strictly decreasing in (-? , ? )

(C) odd and is strictly increasing in (-? , ? )

(D) neither even or odd, but is strictly increasing in (-? , ? )

**3.** Consider a branch of the hyperbola

$x^2 - 2y^2$ - 2?2x - 4?2y - 6 = 0

with vertex at the point A. Let B be one of the end points of its latus rectum. If C is the focus of the hyperbola nearest to the point A, then the area of the triangle ABC is

(A) 1 - ?(2/3)

(B) ?(3/2) - 1

(C) 1 + ?(2/3)

(D) ?(3/2) + 1

**4.** The area of the region between the curves y = ?( (1 + sin x)/cos x ) and y = ?( (1 - sin x)/cos x ) bounded by the lines x = 0 and x = Π/4 is

(A) $\int_0^{\sqrt{2}-1} \frac{t}{(1+t^2)\sqrt{1-t^2}} dt$

(B) $\int_0^{\sqrt{2}-1} \frac{4t}{(1+t^2)\sqrt{1-t^2}} dt$

(C) $\int_0^{\sqrt{2}+1} \frac{4t}{(1+t^2)\sqrt{1-t^2}} dt$

(D) $\int_0^{\sqrt{2}+1} \frac{t}{(1+t^2)\sqrt{1-t^2}} dt$

**5.** Consider three points P = (-sin(β-α), -cos β), Q = (cos(β-α), sin β) and R = (cos(β - α + θ), sin(β - θ), where 0 < α, β, θ < Π/4. Then,

(A) P lies on the line segment RQ

(B) Q lies on the line segment PR

(C) R lies on the line segment QP

(D) P, Q, R are non-collinear

**6.** An experiment has 10 equally likely outcomes. Let A and B be two non-empty events of the experiment. If A consists of 4 outcomes, the number of outcomes that B must have so that A and B are independent, is

(A) 2, 4 or 8

(B) 3, 6 or 9

(C) 4 or 8

(D) 5 or 10

**7.** Let two non-collinear unit vectors a and b form an acute angle. A point P moves so that at any tiem t the position vector OP (where O is the origin) is given by a cos t + b sin t. When P is farthest from origin O, let M be the length of vector OP and u be the unit vector along vector OP. Then,

(A) $\hat{u} = \frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$ and $M = \left(1 + \hat{a}.\hat{b}\right)^{\frac{1}{2}}$

(B) $\hat{u} = \frac{\hat{a}-\hat{b}}{|\hat{a}-\hat{b}|}$ and $M = \left(1 + \hat{a}.\hat{b}\right)^{\frac{1}{2}}$

(C) $\hat{u} = \frac{\hat{a}+\hat{b}}{|\hat{a}+\hat{b}|}$ and $M = \left(1 + 2\hat{a}.\hat{b}\right)^{\frac{1}{2}}$

(D) $\hat{u} = \frac{\hat{a}-\hat{b}}{|\hat{a}-\hat{b}|}$ and $M = \left(1 + 2\hat{a}.\hat{b}\right)^{\frac{1}{2}}$

**8.** Let

$$I = \int \frac{e^{x}}{e^{4x}+e^{2x}+1}\,dx,\; J = \int \frac{e^{-x}}{e^{-4x}+e^{-2x}+1}\,dx.$$

Then, for an arbitrary constant C, the value of J - I equals.

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

(B) $\frac{1}{2}\log\left(\frac{e^{2x}+e^{x}+1}{e^{2x}-e^{x}+1}\right)+C$

(C) $\frac{1}{2}\log\left(\frac{e^{2x}-e^{x}+1}{e^{2x}+e^{x}+1}\right)+C$

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

**9.** Let g(x)&nbs Let g(x) = log f(x) where f(x) is a twice differentiable positive function on (0, ? ) such that f(x + 1) = x f(x). Then, for N = 1, 2, 3, ......,

$$g''\left(N+\frac{1}{2}\right) - g''\left(\frac{1}{2}\right) =$$

(A) $-4\left\{1+\frac{1}{9}+\frac{1}{25}+\cdots+\frac{1}{(2N-1)^2}\right\}$

(B) $4\left\{1+\frac{1}{9}+\frac{1}{25}+\cdots+\frac{1}{(2N-1)^2}\right\}$

(C) $-4\left\{1+\frac{1}{9}+\frac{1}{25}+\cdots+\frac{1}{(2N+1)^2}\right\}$

(D) $4\left\{1+\frac{1}{9}+\frac{1}{25}+\cdots+\frac{1}{(2N+1)^2}\right\}$

**10.** Suppose four distinct positive numbers $a_1, a_2, a_3, a_4$ are in G.P. Let $b_1 = a_1$, $b_2 = b_1 + a_2$, $b_3 = b_2 + a_3$ and $b_4 = b_3 + a_4$.

STATEMENT-1: The numbers $b_1$, $b_2$, $b_3$, $b_4$ are neither in A.P. nor in G.P.

and

STATEMENT-2: The numbers $b_1$, $b_2$, $b_3$, $b_4$ are in H.P.

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

**11.** Let a, b, c, p, q be real numbers. Suppose α, β are the roots of the equation $x^2 + 2px + q = 0$ and α, 1/β are the roots of the equation $ax^2 + 2bx + c = 0$, where $\beta^2$ is not belongs to {-1, 0, 1}.

STATEMENT-1: $(p^2 - q)(b^2 - ac) \geq 0$

and

STATEMENT-2: b $^1$ pa or c $^1$ qa

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True



**12.** Consider

$L_1 : 2x + 3y + p - 3 = 0$

$L_2 : 2x + 3y + p + 3 = 0$

where p is a real number, and C : $x^2 + y^2 + 6x + 10y + 30 = 0$

STATEMENT-1: If line $L_1$ is a chord of circle C, then line $L_2$ is not always a diameter of circle C.

and

STATEMENT-2: If line $L_1$ is a diameter of circle C, then line $L_2$ is not a chord of circle C.

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

**13.** Let a solution y = y(x) of the differential equation

x?$(x^2$-1) dy-y?$(y^2$-1) dx=0

satisfy y(2) = 2/?3.
STATEMENT-1: y(x) = sec($sec^{-1}$ x-π/6)
and
STATEMENT-2: y(x) is given by

1/y=(2?3)/x-?(1-1/$x^2$ )

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.
(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

Paragraph

Consider the function f : (–? , ? ) --> (–? , ? ) defined by

f(x) = $(x^2$-ax+1)/$(x^2$+ax+1), 0 < a < 2.

**14.** Which of the following is true?

(A) $(2 + a)^2 f''(1) + (2 - a)^2 f''(-1) = 0$
(B) $(2 - a)^2 f''(1) - (2 + a)^2 f''(-1) = 0$
(C) $f'(1)f'(-1) = (2 - a)^2$
(D) $f'(1)f'(-1) = (2 + a)^2$

**15.** Which of the following is true?

(A) f(x) is decreasing on (–1, 1) and has a local minimum at x = 1
(B) f(x) is increasing on (–1, 1) and has a local maximum at x = 1
(C) f(x) is increasing on (–1, 1) but has neither a local maximum nor a local minimum at x = 1.
(D) f(x) is decreasing on (–1, 1) but has nether a local maximum nor a local minimum at x = 1.

**16.** Let

g(x) = ?$_0^{ex}$(f'(t))/(1+$t^2$ ) dt.

Which of the following is true?

(A) g’(x) is positive on (–? , 0) and negative on (0, ? )
(B) g’(x) is negative on (–? , 0) and positive on (0, ? )
(C) g’(x) is changes sign on both (–? , 0) and (0, ? )
(D) g’(x) is does not change sign on (–? , ? )

Paragraph

Consider the lines

L1 : (x+1)/3=(y+2)/1=(z+1)/2
L2 : (x-2)/1=(y+2)/2=(z-3)/3

**17.** The unit vector perpendicular to both L1 and L2 is

(A) (-i ?+7j ?+7k ?)/?99
(B) (-i ?-7j ?+5k ?)/(5?3)
(C) (-i ?+7j ?+5k ?)/(5?3)
(D) (7i ?-7j ?-k ?)/?99

**18.** The shortest distance between L1 and L2 is

(A) 0
(B) 17/?3
(C) 41/(5?3)
(D) 17/(5?3)

**19.** The distance of the point (1, 1, 1) from the plane passing through the point (–1, –2, –1) and whose normal is perpendicular to both the lines L1 and L2 is

(A) 2/?75
(B) 7/?75
(C) 13/?75
(D) 23/?75

**20.** Consider the lines given by

$L_1 : x + 3y - 5 = 0$

$L_2 : 3x - ky - 1 = 0$

$L_3 : 5x + 2y - 12 = 0$



Match the Statements/Expressions in Column I with the Statements/ Expressions in Column II.

| Column I | | Column II | |
|---|---|---|---|
| (A) | $L_1$, $L_2$, $L_3$ are concurrent if | (p) | k = -9 |
| (B) | One of $L_1$, $L_2$, $L_3$ is parallel to at least one of the other two, if | (q) | k = - 6/5 |
| (C) | $L_1$, $L_2$, $L_3$ form a triangle if | (r) | k = 5/6 |
| (D) | $L_1$, $L_2$, $L_3$ do not form a triangle if | (s) | k = 5 |

**21.** Match the Statements/Expressions in Column I and the Statements/ Expressions in Column II.

| Column I | | Column II | |
|---|---|---|---|
| (A) | The minimum value of $x^2$+2x+4 / x+2 is | (p) | 0 |

| | | | |
|---|---|---|---|
| (B) | Let A and B be 3 × 3 matrices of real numbers, where A is symmetric, b is skew-symmetric, and (A + B) (A - B) = (A - B) (A + B). If $(AB)^t = (-1)^k$ AB, where $(AB)^t$ is the transpose of the matrix AB, then the possible values of k are | (q) | 1 |
| (C) | Let a = $\log_3 \log_3 2$. An integer k satisfying $1 < 2^{(-k+3^{\wedge}-a)}$ <2, , must be less than | (r) | 2 |
| (D) | If sin q = cos f, then the possible values of 1/Π(θ±Ø-Π/2) are | (s) | 3 |

**22.** Consider all possible permutations of the letters of the word ENDEANOEL.

Match the Statements/Expressions in Column I and the Statements/ Expressions in Column II.

| Column I | | Column II | |
|---|---|---|---|
| (A) | The number of permutations containing the word ENDEA is | (p) | 5! |
| (B) | The number of permutations in which the letter E occurs in the first and the last positions i | (q) | 2 × 5! |
| (C) | The number of permutations in which one of the letters, D, L, N occurs in the last five positions is | (r) | 7 × 5! |
| (D) | The number of permutations in which the letters A, E, O occur only in odd positions is | (s) | 21 × 5! |