PART 1 - MATHEMATICS

Topic : Conic sections, Application of integrals

SECTION–1 : (Maximum Marks : 12)

- This section contains **FOUR** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +3	If ONLY the correct option is chosen;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −1	In all other cases.

1. Let P be the point on the parabola $y = x^2$ such that the slope of the tangent to the parabola at the point P is 4 . Let Q be the point in the first quadrant lying on the circle $x^2 + y^2 = 2$ such that the slope of the tangent to the circle at the point Q is −1 . Let R be the point in the first quadrant lying on the ellipse $x^2 + 4y^2 = 8$ such that the slope of the tangent to the ellipse at the point R is $-\frac{1}{2}$. Then the radius of the circle passing through the points P, Q and R is [JEE Advanced 2026 Paper 1]

(A) $\sqrt{10}$ (B) $\sqrt{5}$ (C) $\sqrt{\frac{5}{2}}$ (D) $2\sqrt{5}$

Scan or tap for the full solution

2. Let T be the tangent to the parabola $y^2 = 16x$ at the point (64,32). Let L be the tangent to the same parabola at another point (x_1, y_1) on the parabola. If L and T are perpendicular to each other, then the distance between the point (x_1, y_1) and the focus of the parabola, is [JEE Advanced 2026 Paper 2]

(A) $\frac{15}{4}$ (B) 4 (C) $\frac{17}{4}$ (D) 5

Solution

3. Let S denote the locus of the point of intersection of the pair of lines

$4x - 3y = 12\alpha$,

$4\alpha x + 3\alpha y = 12$,

where α varies over the set of non-zero real numbers. Let T be the tangent to S passing through the points (p,0) and (0,q), q > 0, and parallel to the line $4x - \frac{3}{\sqrt{2}}y = 0$.

Then the value of pq is [JEE Advanced 2025 Paper 2]

(A) $-6\sqrt{2}$ (B) $-3\sqrt{2}$ (C) $-9\sqrt{2}$ (D) $-12\sqrt{2}$

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Space for Rough Work

4. Consider the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$. Let S(p,q) be a point in the first quadrant such that $\frac{p^2}{9}+\frac{q^2}{4}>1$. Two tangents are drawn from S to the ellipse, of which one meets the ellipse at one end point of the minor axis and the other meets the ellipse at a point T in the fourth quadrant. Let R be the vertex of the ellipse with positive x-coordinate and O be the center of the ellipse. If the area of the triangle ΔORT is $\frac{3}{2}$, then which of the following options is correct? [JEE Advanced 2024 Paper 1]

(A) $q=2,\ p=3\sqrt{3}$ (B) $q=2,\ p=4\sqrt{3}$ (C) $q=1,\ p=5\sqrt{3}$ (D) $q=1,\ p=6\sqrt{3}$

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Space for Rough Work

SECTION–2 : (Maximum Marks : 8)

- This section contains **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +4	ONLY if (all) the correct option(s) is(are) chosen;
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen;
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −2	In all other cases.

- For example, in a question, if **(A), (B) and (D)** are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get −2 marks.

5. Let $P(x_1,y_1)$ and $Q(x_2,y_2)$ be two distinct points on the ellipse

$$\frac{x^2}{9}+\frac{y^2}{4}=1$$

such that $y_1 > 0$, and $y_2 > 0$. Let C denote the circle $x^2 + y^2 = 9$, and M be the point (3,0).
Suppose the line $x = x_1$ intersects C at R, and the line $x = x_2$ intersects C at S, such that the y-coordinates of R and S are positive. Let $\angle ROM = \frac{\pi}{6}$ and $\angle SOM = \frac{\pi}{3}$, where O denotes the origin (0,0). Let |XY| denote the length of the line segment XY.
Then which of the following statements is (are) TRUE? [JEE Advanced 2025 Paper 2]

(A) The equation of the line joining P and Q is $2x+3y=3(1+\sqrt{3})$

(B) The equation of the line joining P and Q is $2x+y=3(1+\sqrt{3})$

(C) If $N_2 = (x_2,0)$, then $3|N_2Q| = 2|N_2S|$

(D) If $N_1 = (x_1,0)$, then $9|N_1P| = 4|N_1R|$

Solution

6. Let A_1,B_1,C_1 be three points in the xy-plane. Suppose that the lines A_1C_1 and B_1C_1 are tangents to the curve $y^2 = 8x$ at A_1 and B_1, respectively. If O = (0,0) and $C_1 = (-4,0)$, then which of the following statements is (are) TRUE? [JEE Advanced 2024 Paper 2]

(A) The length of the line segment OA_1 is $4\sqrt{3}$

(B) The length of the line segment A_1B_1 is 16

(C) The orthocenter of the triangle $A_1B_1C_1$ is (0,0)

(D) The orthocenter of the triangle $A_1B_1C_1$ is (1,0)

Solution

Space for Rough Work

SECTION–3 : (Maximum Marks : 16)

- This section contains **ONE** paragraph.
- Based on each paragraph, there are **FOUR** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, −0.33, −.30, 30.27, −127.30) in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct answer is entered;
Zero Marks : 0 In all other cases.

7. Consider the ellipse E given by $\frac{x^2}{18}+\frac{y^2}{12}=1$. Let H be the hyperbola whose eccentricity is the reciprocal of the eccentricity of E and whose foci are the same as that of E. Let P and Q be the points of intersection of H and the parabola $\sqrt{5}\,y=x^2$ in the first quadrant. Let d be the distance between P and Q.

If a and b are the integers such that $d^2=a+b\sqrt{5}$, then the value of a − b is _____.

[JEE Advanced 2026 Paper 2]

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Paragraph for Questions 8 and 9

Consider the ellipses given by
$x^2 + 4y^2 = 1$ and $4x^2 + y^2 = 1$.

8. Let P be the point in the first quadrant where the given ellipses intersect. If θ is the acute angle between the tangents to the given ellipses at the point P, then the value of $4\tan\theta$ is _____.

[JEE Advanced 2026 Paper 2]

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9. If α is the area of the common region that lies inside both the given ellipses, then the value of $\cot\alpha$ is _____.

[JEE Advanced 2026 Paper 2]

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10. A normal with slope $\frac{1}{\sqrt{6}}$ is drawn from the point $(0,-\alpha)$ to the parabola $x^2 = -4ay$, where $a > 0$. Let L be the line passing through $(0,-\alpha)$ and parallel to the directrix of the parabola. Suppose that L intersects the parabola at two points A and B. Let r denote the length of the latus rectum and s denote the square of the length of the line segment AB. If r:s = 1:16, then the value of 24a is _____.

[JEE Advanced 2024 Paper 2]

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SECTION–4 : (Maximum Marks : 8)

- This section contains **TWO** questions.
- Each question has **TWO** lists: **List-I** and **List-II**.
- Four options are given representing matching of elements from List-I and List-II. **ONLY ONE** of these four options corresponds to a correct matching.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : −1 In all other cases.

11. Match each entry in **List-I** to the correct entry in **List-II** and choose the correct option.

[JEE Advanced 2026 Paper 1]

	List-I		List-II
P.	The circle with centre (1, 2) and touching the straight line $3x + 4y = 1$, passes through	1.	the point (1, 1)
Q.	The common tangent to the circle $x^2 + y^2 = 2$ and the parabola $y^2 = 8x$ with positive slope, passes through	2.	the point (7, 9)
R.	Let M be the end point of the latus rectum of the ellipse $3x^2 + 4y^2 = 48$ such that M lies in the first quadrant. Then the normal to the ellipse drawn at M passes through	3.	the point (3, 2)
S.	Let H be the hyperbola whose centre is at the origin, one of the foci is at (5, 0), and one directrix is $5x + 16 = 0$. Then H passes through	4.	the point (2, 5)
		5.	the point $(8, 3\sqrt{3})$

(A) (P) → (3), (Q) → (4), (R) → (1), (S) → (2)
(B) (P) → (3), (Q) → (2), (R) → (1), (S) → (5)
(C) (P) → (3), (Q) → (2), (R) → (4), (S) → (5)
(D) (P) → (4), (Q) → (1), (R) → (2), (S) → (3)

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12. Let the straight line $y = 2x$ touch a circle with center $(0, \alpha)$, $\alpha > 0$, and radius r at a point A_1. Let B_1 be the point on the circle such that the line segment A_1B_1 is a diameter of the circle. Let $\alpha + r = 5 + \sqrt{5}$.

Match each entry in **List-I** to the correct entry in **List-II**. [JEE Advanced 2024 Paper 1]

	List-I		List-II
P.	α equals	1.	$(-2,4)$
Q.	r equals	2.	$\sqrt{5}$
R.	A_1 equals	3.	$(-2,6)$
S.	B_1 equals	4.	5
		5.	$(2,4)$

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(A) (P) → (4) (Q) → (2) (R) → (1) (S) → (3)
(B) (P) → (2) (Q) → (4) (R) → (1) (S) → (3)
(C) (P) → (4) (Q) → (2) (R) → (5) (S) → (3)
(D) (P) → (2) (Q) → (4) (R) → (3) (S) → (5)

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JEE ADVANCED CONIC SECTIONS — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION–1

Ques.	1	2	3	4
Ans.	C	C	A	A

SECTION–2

Ques.	5	6
Ans.	A, C	A, C

SECTION–3

Ques.	7	8	9	10
Ans.	18	7.4 to 7.6	0.74 to 0.76	12

SECTION–4

Ques.	11	12
Ans.	B	C

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