Some questions (Assertion–Reason type) are given below. Each question contains **Statement – 1 (Assertion)** and **Statement – 2 (Reason)**. Each question has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. So select the correct choice :

Choices are :

(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.

PARABOLA

286. **Statement-1 :** Slope of tangents drawn from (4, 10) to parabola $y^2 = 9x$ are $\frac{1}{4}, \frac{9}{4}$.
Statement-2 : Every parabola is symmetric about its directrix.

287. **Statement-1 :** Though $(\lambda, \lambda + 1)$ there can't be more than one normal to the parabola $y^2 = 4x$, if $\lambda < 2$.
Statement-2 : The point $(\lambda, \lambda + 1)$ lies outside the parabola for all $\lambda \neq 1$.

288. **Statement-1 :** If $x + y = k$ is a normal to the parabola $y^2 = 12x$, then k is 9.
Statement-2 : Equation of normal to the parabola $y^2 = 4ax$ is $y - mx + 2am + am^3 = 0$

289. **Statement-1 :** If b, k are the segments of a focal chord of the parabola $y^2 = 4ax$, then k is equal to ab/b-a.
Statement-2 : Latus rectum of the parabola $y^2 = 4ax$ is H.M. between the segments of any focal chord of the parabola

290. **Statement-1 :** Two parabolas $y^2 = 4ax$ and $x^2 = 4ay$ have common tangent $x + y + a = 0$
Statement-2 : $x + y + a = 0$ is common tangent to the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ and point of contacts lie on their respective end points of latus rectum.

291. **Statement-1 :** In parabola $y^2 = 4ax$, the circle drawn taking focal radii as diameter touches y-axis.
Statement-2 : The portion of the tangent intercepted between point of contact and directix subtends 90° angle at focus.

292. **Statement-1 :** The joining points (8, -8) & (1/2, –2), which are lying on parabola $y^2 = 4ax$, pass through focus of parabola.
Statement-2 : Tangents drawn at (8, -8) & (1/2, -2) on the parabola $y^2 = 4ax$ are perpendicular.

293. **Statement-1 :** There are no common tangents between circle $x^2 + y^2 - 4x + 3 = 0$ and parabola $y^2 = 2x$.
Statement-2 : Equation of tangents to the parabola $x^2 = 4ay$ is $x = my + a/m$ where m denotes slope of tangent.

294. **Statement-1 :** Three distinct normals of the parabola $y^2 = 12x$ can pass through a point (h ,0) where $h > 6$.
Statement-2 : If $h > 2a$ then three distinct nroamls can pass through the point (h, 0) to the parabola $y^2 = 4ax$.

295. **Statement-1 :** The normals at the point (4, 4) and $\left(\frac{1}{4}, -1\right)$ of the parabola $y^2 = 4x$ are perpendicular.
Statement-2 : The tangents to the parabola at the and of a focal chord are perpendicular.

296. **Statement-1 :** Through $(\lambda, \lambda + 1)$ there cannot be more than one-normal to the parabola $y^2 = 4x$ if $\lambda < 2$.
Statement-2 : The point $(\lambda, \lambda + 1)$ lines out side the parabola for all $\lambda \neq 1$.

297. **Statement-1 :** Slope of tangents drawn from (4, 10) to parabola $y^2 = 9x$ are 1/4, 9/4
Statement-2 : Every parabola is symmetric about its axis.

298. **Statement-1 :** If a parabola is defined by an equation of the form $y = ax^2 + bx + c$ where $a, b, c \in R$ and $a > 0$, then the parabola must possess a minimum.
Statement-2 : A function defined by an equation of the form $y = ax^2 + bx + c$ where $a, b, c \in R$ and $a \neq 0$, may not have an extremum.

299. **Statement-1 :** The point $(\sin \alpha, \cos \alpha)$ does not lie outside the parabola $2y^2 + x - 2 = 0$ when $\alpha \in \left[\frac{\pi}{2}, \frac{5\pi}{6}\right] \cup \left[\pi, \frac{3\pi}{2}\right]$
Statement-2 : The point (x_1, y_1) lies outside the parabola $y^2 = 4ax$ if $y_1^2 - 4ax_1 > 0$.

300. **Statement-1 :** The line $y = x + 2a$ touches the parabola $y^2 = 4a(x + a)$.
Statement-2 : The line $y = mx + c$ touches $y^2 = 4a(x + a)$ if $c = am + a/m$.

301. **Statement-1 :** If PQ is a focal chord of the parabola $y^2 = 32x$ then minimum length of PQ = 32.
Statement-2 : Latus rectum of a parabola is the shortest focal chord.

302. **Statement-1 :** Through $(\lambda, \lambda + 1)$, there can't be more than one normal to the parabola $y^2 = 4x$ if $\lambda < 2$.
Statement–2 : The point $(\lambda, \lambda + 1)$ lies outside the parabola for all $\lambda \in R \sim \{1\}$.

303. **Statement–1 :** Perpendicular tangents to parabola $y^2 = 8x$ meets on $x + 2 = 0$
Statement–2 : Perpendicular tangents of parabola meets on tangent at the vertex.

304. Let $y^2 = 4ax$ and $x^2 = 4ay$ be two parabolas
Statement-1: The equation of the common tangent to the parabolas is $x + y + a = 0$
Statement-2: Both the parabolas are reflected to each other about the line $y = x$.

305. Let $y^2 = 4a(x + a)$ and $y^2 = 4b(x + b)$ are two parabolas
Statement-1 : Tangents are drawn from the locus of the point are mutually perpendicular
State.-2: The locus of the point from which mutually perpendicular tangents can be drawn to the given comb is $x + y + b = 0$

ELLIPSE

306. Tangents are drawn from the point (-3, 4) to the curve $9x^2 + 16y^2 = 144$.
STATEMENT -1: The tangents are mutually perpendicular.
STATEMENT-2: The locus of the points from which mutually perpendicular tangents can be drawn to the given curve is $x^2 + y^2 = 25$.

307. **Statement–1 :** Circle $x^2 + y^2 = 9$, and the circle $(x - \sqrt{5})(\sqrt{2}x - 3) + y(\sqrt{2}y - 2) = 0$ touches each other internally.
Statement–2 : Circle described on the focal distance as diameter of the ellipse $4x^2 + 9y^2 = 36$ touch the auxiliary circle $x^2 + y^2 = 9$ internally

308. **Statement–1 :** If the tangents from the point $(\lambda, 3)$ to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ are at right angles then λ is equal to ± 2.
Statement–2 : The locus of the point of the intersection of two perpendicular tangents to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, is $x^2 + y^2 = a^2 + b^2$.

309. **Statement–1 :** $x - y - 5 = 0$ is the equation of the tangent to the ellipse $9x^2 + 16y^2 = 144$.
Statement–2 : The equation of the tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is of the form $y = mx \pm \sqrt{a^2m^2 + b^2}$.

310. **Statement–1 :** At the most four normals can be drawn from a given point to a given ellipse.
Statement–2 : The standard equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ of an ellipse does not change on changing x by – x and y by – y.

311. **Statement–1 :** The focal distance of the point $(4\sqrt{3}, 5)$ on the ellipse $25x^2 + 16y^2 = 1600$ will be 7 and 13.
Statement–2 : The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and having its centre at (0, 3) is 5.

312. **Statement-1 :** The least value of the length of the tangents to $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ intercepted between the coordinate axes is a + b.
Statement-2 : If x_1 and x_2 be any two positive numbers then $\frac{x_1 + x_2}{2} \geq \sqrt{x_1 + x_2}$

313. **Statement-1 :** In an ellipse the sum of the distances between foci is always less than the sum of focal distances of any point on it.
Statement-2 : The eccentricity of any ellipse is less than 1.

314. **Statement-1 :** Any chord of the conic $x^2 + y^2 + xy = 1$, through (0, 0) is bisected at (0, 0)
Statement-2 : The centre of a conic is a point through which every chord is bisected.

315. **Statement-1 :** A tangent of the ellipse $x^2 + 4y^2 = 4$ meets the ellipse $x^2 + 2y^2 = 6$ at P & Q. The angle between the tangents at P and Q of the ellipse $x^2 + 2y^2 = 6$ is $\pi/2$
Statement-2 : If the two tangents from to the ellipse $x^2/a^2 + y^2/b^2 = 1$ are at right angle, then locus of P is the circle $x^2 + y^2 = a^2 + b^2$.

316. **Statement-1 :** The equation of the tangents drawn at the ends of the major axis of the ellipse $9x^2 + 5y^2 - 30y = 0$ is $y = 0$, $y = 7$.
Statement-1 : The equation of the tangent drawn at the ends of major axis of the ellipse $x^2/a^2 + y^2/b^2 = 1$ always parallel to y-axis

317. **Statement-1 :** Tangents drawn from the point (3, 4) on to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ will be mutually perpendicular

Statement-2 : The points (3, 4) lies on the circle $x^2 + y^2 = 25$ which is director circle to the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$.

318. **Statement-1 :** For ellipse $\frac{x^2}{5}+\frac{y^2}{3}=1$, the product of the perpendicular drawn from focii on any tangent is 3.

Statement-2 : For ellipse $\frac{x^2}{5}+\frac{y^2}{3}=1$, the foot of the perpendiculars drawn from foci on any tangent lies on the circle $x^2 + y^2 = 5$ which is auxiliary circle of the ellipse.

319. **Statement-1 :** If line $x + y = 3$ is a tangent to an ellipse with foci (4, 3) & (6, y) at the point (1, 2), then y = 17.
Statement-2 : Tangent and normal to the ellipse at any point bisects the angle subtended by foci at that point.

320. **Statement-1 :** Tangents are drawn to the ellipse $\frac{x^2}{4}+\frac{y^2}{2}=1$ at the points, where it is intersected by the line $2x + 3y = 1$. Point of intersection of these tangents is (8, 6).

Statement-2 : Equation of chord of contact to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ from an external point is given by $\frac{xx_1}{a^2}+\frac{yy_1}{b^2}-1=0$

321. **Statement-1 :** In an ellipse the sum of the distances between foci is always less than the sum of focal distances of any point on it.
Statement-2 : The eccentricity of any ellipse is less than 1.

322. **Statement-1 :** The equation $x^2 + 2y^2 + \lambda xy + 2x + 3y + 1 = 0$ can never represent a hyperbola
Statement-2 : The general equation of second degree represent a hyperbola it $h^2 > ab$.

323. **Statement-1 :** The equation of the director circle to the ellipse $4x^2 + 9x^2 = 36$ is $x^2 + y^2 = 13$.
Statement-2 : The locus of the point of intersection of perpendicular tangents to an ellipse is called the director circle.

324. **Statement-1 :** The equation of tangent to the ellipse $4x^2 + 9y^2 = 36$ at the point (3, –2) is $\frac{x}{3}-\frac{y}{2}=1$.

Statement-2 : Tangent at (x_1, y_1) to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is $\frac{xx_1}{a^2}-\frac{yy_1}{b^2}=1$

325. **Statement-1 :** The maximum area of $\Delta PS_1 S_2$ where S_1, S_2 are foci of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and P is any variable point on it, is abe, where e is eccentricity of the ellipse.
Statement-2 : The coordinates of pare $(a \sec \theta, b \tan \theta)$.

326. **Statement-1 :** In an ellipse the sum of the distances between foci is always less than the sum of focal distance of any point on it.
Statement-2 : The eccentricity of ellipse is less than 1.

HYPERBOLA

327. Let $Y = \pm \frac{2}{3}\sqrt{x^2-9}$ $x\in [3, \infty)$ and $Y_1 = \pm \frac{2}{3}\sqrt{x^2-9}$ be $x\in (-\infty, -3]$ two curves.

Statement 1: The number of tangents that can be drawn from $\left(5,-\frac{10}{3}\right)$ to the curve $Y_1 = \pm \frac{2}{3}\sqrt{x^2-9}$ is zero

Statement 2: The point $\left(5, -\frac{10}{3}\right)$ **lies on the curve** $Y = \pm\frac{2}{3}\sqrt{x^2-9}$ **.**

328. **Statement–1 :** If (3, 4) is a point of a hyperbola having focus (3, 0) and (λ, 0) and length of the transverse axis being 1 unit then λ can take the value 0 or 3.

Statement–2 : $|S'P - SP| = 2a$, where S and S′ are the two focus 2a = length of the transverse axis and P be any point on the hyperbola.

329. **Statement–1 :** The eccentricity of the hyperbola $9x^2 - 16y^2 - 72x + 96y - 144 = 0$ is $\frac{5}{4}$.

Statement–2 : The eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is equal to $\sqrt{1 + \frac{b^2}{a^2}}$.

330. Let a, b, $\alpha \in R - \{0\}$, where a, b are constants and α is a parameter.

Statement–1 : All the members of the family of hyperbolas $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{\alpha^2}$ have the same pair of asymptotes.

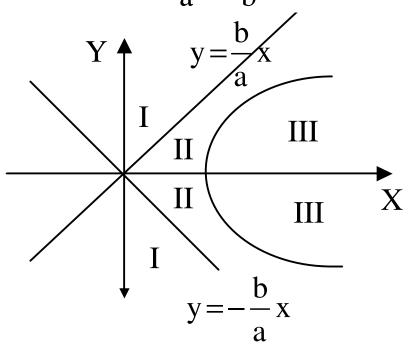
Statement–2 : Change in α, does not change the slopes of the asymptotes of a member of the family $\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{1}{\alpha^2}$.

331. **Statement–1 :** The slope of the common tangent between the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $-\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ may be 1 or – 1.

Statement–2 : The locus of the point of inteeersection of lines $\frac{x}{a} - \frac{y}{b} = m$ and $\frac{x}{a} + \frac{y}{b} = \frac{1}{m}$ is a hyperbola (where m is variable and $ab \neq 0$).

332. **Statement–1 :** The equation $x^2 + 2y^2 + \lambda xy + 2x + 3y + 1 = 0$ can never represent a hyperbola.
Statement–2 : The general equation of second degree represents a hyperbola if $h^2 > ab$.

333. **Statement–1** If a point (x_1, y_1) lies in the region II of $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, shown in the figure, then $\frac{x_1^2}{a^2} - \frac{y_1^2}{b^2} < 0$



Statement–2 If $(P(x_1, y_1)$ lies outside the a hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then $\frac{x_1^2}{a^2} - \frac{y_1^2}{b^2} < 1$

334. **Statement–1** Equation of tangents to the hyperbola $2x^2 - 3y^2 = 6$ which is parallel to the line $y = 3x + 4$ is $y = 3x - 5$ and $y = 3x + 5$.
Statement–2 $y = mx + c$ is a tangent to $x^2/a^2 - y^2/b^2 = 1$ if $c^2 = a^2m^2 + b^2$.

335. **Statement–1 :** There can be infinite points from where we can draw two mutually perpendicular tangents on to the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$

Statement–2 : The director circle in case of hyperbola $\frac{x^2}{9}-\frac{y^2}{16}=1$ will not exist because $a^2 < b^2$ and director circle is $x^2 + y^2 = a^2 - b^2$.

336. **Statement–1 :** The average point of all the four intersection points of the rectangular hyperbola $xy = 1$ and circle $x^2 + y^2 = 4$ is origin (0, 0).
Statement–2 : If a rectangular hyperbola and a circle intersect at four points, the average point of all the points of intersection is the mid point of line-joining the two centres.

337. **Statement–1 :** No tangent can be drawn to the hyperbola $\frac{x^2}{2}-\frac{y^2}{1}=1,$ which have slopes greater than $\frac{1}{\sqrt{2}}$
Statement–2 : Line $y = mx + c$ is a tangent to hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$. If $c^2 = a^2m^2 - b^2$

338. **Statement–1 :** Eccentricity of hyperbola $xy - 3x - 3y = 0$ is 4/3
Statement–2 : Rectangular hyperbola has perpendicular asymptotes and eccentricity = $\sqrt{2}$

339. **Statement–1 :** The equation $x^2 + 2y^2 + \lambda xy + 2x + 3y + 1 = 0$ can never represent a hyperbola
Statement–2 : The general equation of second degree represent a hyperbola it $h^2 > ab$.

340. **Statement–1 :** The combined equation of both the axes of the hyperbola $xy = c^2$ is $x^2 - y^2 = 0$.
Statement–2 : Combined equation of axes of hyperbola is the combined equation of angle bisectors of the asymptotes of the hyperbola.

341. **Statement–1 :** The point (7, –3) lies inside the hyperbola $9x^2 - 4y^2 = 36$ where as the point (2, 7) lies outside this.
Statement–2 : The point (x_1, y_1) lies outside, on or inside the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ according as $\frac{x_1^2}{a^2}-\frac{y_1^2}{b^2}-1$ < or = or > 0

342. **Statement–1 :** The equation of the chord of contact of tangents drawn from the point (2, –1) to the hyperbola $16x^2 - 9y^2 = 144$ is $32x + 9y = 144$.
Statement–2 : Pair of tangents drawn from (x_1, y_1) to $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is $SS_1 = T^2$ $S=\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ $S_1=\frac{x_1^2}{a^2}-\frac{y_1^2}{b^2}-1$

343. **Statement–1 :** If PQ and RS are two perpendicular chords of $xy = x^e$, and C be the centre of hyperbola $xy = c^2$. Then product of slopes of CP, CQ, CR and CS is equal to 1.
Statement–2 : Equation of largest circle with centre (1, 0) and lying inside the ellipse $x^2 + 4y^2$ 16 is $3x^2 + 3y^2 - 6x - 8 = 0$.

Answer

286. C	287. B	288. A	289. C	290. B	291. B	292. B	293. C	294. A	295. A	296. B	297. A	298. C	299. B	300. A
301. A	302. B	303. C	304. B	305. A	306. A	307. A	308. A	309. A	310. B	311. C	312. B	313. A	314. A	315. A
316. C	317. A	318. B	319. A	320. D	321. A	322. A	323. A	324. C	325. C	326. A	327. A	328. D	329. A	330. A
331. B	332. D	333. D	334. C	335. D	336. A	337. A	338. D	339. A	340. A	341. A	342. B	343. B		

Solution

286. Option (C) is correct.

$y = mx + \frac{a}{m}$

$10 = 4m - 1. \frac{9/4}{m}$

$\Rightarrow 16m^2 - 40m + 9 = 0$ $\Rightarrow m_1 = \frac{1}{4}, m_2 = \frac{9}{4}$

Every $m_1 = \frac{1}{4}, m_2 = \frac{9}{4}$ Every parabola is symmetric about its axis.

287. Option (B) is correct
Any normal to $y^2 = 4x$ is

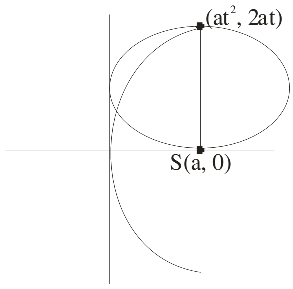
$Y + tx = 2t + t^3$
If this passes through $(\lambda, \lambda + 1)$, we get
$\lambda + 1 + \lambda = 2t + t^3$
$\Rightarrow t^3 + t(2 - \lambda) - \lambda - 1 = 0 = f(t)$ (say)
If $\lambda < 2$, then $f'(t) = 3t^2 + (2 - \lambda) > 0$
$\Rightarrow f(t) = 0$ will have only one real root. So A is true.
Statement 2 is also true b′ coz $(\lambda + 1)^2 > 4\lambda$ is true $\forall\ \lambda \neq 1$. The statement is true but does not follow true statement-2.

288. For the parabola $y^2 = 12x$, equation of a normal with slope -1 is y = -x -2. 3(-1) -3 (-1) 3
$\Rightarrow x + y = 9, \Rightarrow k = 9$ Ans. (A).

289. $SP = a + at_1^2 = a(1 + t_1^2)$
$SQ = a + a/t_1^2 = = \dfrac{a(1+t_1^2)}{t_1^2}$
$$\frac{1}{SP}+\frac{1}{SQ} = \frac{(1+t_1^2)}{a(1+t_1^2)}=\frac{1}{a}$$
$\dfrac{1}{SP},\dfrac{1}{2a},\dfrac{1}{SQ}$ are in A.P.
$\Rightarrow$ 2a is H.M. between SP & SQ
Hence $\dfrac{1}{b}+\dfrac{1}{k}=\dfrac{1}{a} \Rightarrow \dfrac{1}{k}=\dfrac{1}{a}-\dfrac{1}{b}$ $\Rightarrow k = ab/b\text{-}a = \dfrac{b-a}{ab}$ Ans. (C)

290. $y^2 = 4ax$
equation of tangent of slope 'm'
$y = mx + \dfrac{a}{m}$
If it touches $x^2 = 4ay$ then $x^2 = 4a\,(mx + a/m)$
$x^2 - 4amx - \dfrac{4a^2}{m} = 0$ will have equal roots
D = 0
$16a^2 m^2 + \dfrac{16a^2}{m} = 0$
$m^3 = -1 \Rightarrow m = -1$
So $y = -x - a \Rightarrow x + y + a = 0$
(a, -2a) & (-2a, a) lies on it 'B' is correct.

291. $(x - a)(x - at^2) + y\,(y - 2at) = 0$
Solve with x = 0
$a^2t^2 + y\,(y - 2at) = 0$
$y^2 - 2aty + a^2t^2 = 0$
If it touches y-axis then above quadratic must have equal roots. SO, D = 0
$4a^2t^2 - 4a^2t^2 = 0$ which is correct.
'B' is correct.



296. (B) Any normal to the parabola $y^2 = 4x$ is $y + tx = 2t + t^3$
It this passes through $(\lambda, \lambda + 1)$
$\Rightarrow t^3 + t(2 - \lambda) - \lambda - 1 = 0 = f(t)$ say)
$\lambda < 2$ than $f'(t) = 3t^2 + (2 - \lambda) > 0$
$\Rightarrow f(t) = 0$ will have only one real root $\Rightarrow$ A is true
The statement-2 is also true since $(\lambda + 1)^2 > 4\lambda$ is true for all $\lambda \neq 1$. The statement-2 is true but does not follow true statement-2.

297. $y = mx + \dfrac{a}{m}$

$10 = 4m + \dfrac{9/4}{m} \Rightarrow 16m^2 - 40m + 9 = 0$

$m_1 = 1/4$, $m_2 = 9/4$

Every parabola is symmetric about its axis.

298. (C) Statement-1 is true but Statement-2 is false.

299. (B)

If the point $(\sin\alpha, \cos\alpha)$ lies inside or on the parabola $2y^2 + x - 2 = 0$ then $2\cos^2\alpha + \sin\alpha - 2 \le 0$

$\Rightarrow \sin\alpha(2\sin\alpha - 1) \ge 0$ $\Rightarrow \sin\alpha \le 0$, or $\sin\alpha \ge \dfrac{1}{2}$.

300. (A) $y = (x + a) + a$ is of the form

$y = m(x + a) + a/m$ where $m = 1$.

Hence the line touches the parabola.

302. Any normal to the parabola $y^2 = 4x$ is $y + xt = 2t + t^3$

If this passes through $(\lambda, \lambda + 1)$. We get $\lambda + 1 + \lambda t = 2t + t^3$.

$\Rightarrow t^3 + t(2 - \lambda) - (\lambda + 1) = 0 = f(t)$ (let)

if $\lambda < 2$, then, $f'(t) = 3t^2 + (2 - \lambda) > 0$

$\Rightarrow f(t) = 0$ will have only one real root.

$\Rightarrow$ statement–I is true. Statement–II is also true since $(\lambda + 1)^2 > 4\lambda$ is true for all $\lambda \in R \sim \{1\}$.

Statement – I is true but does ot follow true statement – II.

Hence (b) is the correct answer.

304. (B) Because the common tangent has to be perpendicular to $y = x$. Its slope is -1.

307. Ellipse is $\dfrac{x^2}{9} + \dfrac{y^2}{4} = 1$

focus $\equiv (\sqrt{5}, 0)$, $e = \dfrac{\sqrt{5}}{3}$, Any point an ellipse $\equiv \left(\dfrac{3}{\sqrt{2}}, \dfrac{2}{\sqrt{2}}\right)$

equation of circle as the diameter, joining the points $\left(3/\sqrt{2},\ 2/\sqrt{2}\right)$ and focus $(\sqrt{5}, 0)$ is

$(x - \sqrt{5})(\sqrt{2}\,x - 3) + y(\sqrt{2}.y - 2) = 0$ (A) is the correct option.

308. (a) $(\lambda, 3)$ should satisfy the equation $x^2 + y^2 = 13$

$\therefore \lambda = \pm 2$.

309. (A)

Here $a = 4$, $b = 3$ and $m = 1$

$\therefore$ equation of the tangent is $y = x \pm \sqrt{16+9}$

$y = x \pm 5$.

310. Statement – I is true as it is a known fact and statement – II is obviously true. However statement – II is not a true reasoning for statement – I, as coordinate system has nothing to do with statement – I.

311. Given ellipse is $\dfrac{x^2}{64} + \dfrac{y^2}{100} = 1$

$\Rightarrow a^2 = 64; b^2 = 100 \Rightarrow e = \dfrac{3}{5}(\because a < b)$

Now, focal distance of (x_1, y_1) on ellipse will be 7 and 13.

Now, for ellipse $\dfrac{x^2}{16} + \dfrac{y^2}{9} = 1 \Rightarrow a^2 = 16,\ b^2 = 9,\ e = \dfrac{\sqrt{7}}{4}$. $\Rightarrow$ Focus is (ae, 0) or $\left(\sqrt{7},\ 0\right)$.

Now radius of the circle = Distance between $\left(\sqrt{7},\ 0\right)$ and (0, 3) = 4.

Hence (c) is the correct answer.

313. Option (A) is correct
Sum of the distance between foci = 2ae
Sum of the focal distances = $\frac{2a}{e}$
ae < $\frac{a}{e}$ b′coz e < 1.
Both are true and it is correct reason.

314. Option (A) is true.
Let y = mx be any chord through (0, 0). This will meet conic at points whose x-coordinates are given by $x^2 + m^2x^2 + mx^2 = 1$
$\Rightarrow (1 + m + m^2)\, x^2 - 1 = 0$
$\Rightarrow x_1 + x_2 = 0 \Rightarrow \frac{x_1 + x_2}{2} = 0$
Also $y_1 = mx_1$, $y_2 = mx_2$
$\Rightarrow y_1 + y_2 = m\,(x_1 + x_2) = 0$
$\Rightarrow \frac{y_1 + y_2}{2} = 0$ ⇒ mid-point of chord is (0, 0) ∀m.

315. Equation of PQ (i.e., chord of contact) to the ellipse $x^2 + 2y^2 = 6$
$\frac{hx}{6} + \frac{ky}{3} = 1$ ... (1)
Any tangent to the ellipse $x^2 + 4y^2 = 4$ is
i.e., $x/2 \cos\theta + y\sin\theta = 1$ ... (2)
⇒ (1) & (2) represent the same line $h = 3\cos\theta$, $k = 3\sin\theta$
Locus of R (h, k) is $x^2 + y^2 = 9$ Ans. (A)

316. $x^2/5 + (y-3)^2/9 = 1$
Ends of the major axis are (0, 6) and (0, 0)
Equation of tangent at (0, 6) and (0, 0) is y = 6, and y = 0
Anc. (C)

317. $\frac{x^2}{16} + \frac{y^2}{9} = 1$ will have director circle $x^2 + y^2 = 16 + 9$
$\Rightarrow x^2 + y^2 = 25$
and we know that the locus of the point of intersection of two mutually perpendicular tangents drawn to any standard ellipse is its director circle.
'a' is correct.

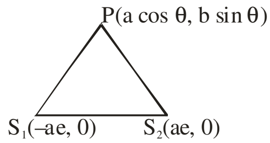
318. By formula $p_1p_2 = b^2$
$= 3.$
also foot of perpendicular lies on auxiliary circle of the ellipse.
'B' is correct.

321. Sum of distances between foci = 2ae sum of the focal distances = 2a/e
ae < a/e since e < 1. (A)

322. The statement-1 is false. Since this will represent hyperbola if $h^2 > ab$
$\Rightarrow \frac{\lambda^2}{4} > 2 \Rightarrow |\lambda| > 2\sqrt{2}$
Thus reason R being a standard result is true. (A)

323. (a) Both Statement-1 and Statement-2 are True and Statement-2 is the correct explanation of Statement-1.

324. (C) Required tangent is
$$\frac{3x}{9} - \frac{2y}{4} = 1 \quad \text{or} \quad \frac{x}{3} - \frac{y}{2} = 1$$



325. (C)
area of $\Delta PS_1 S_2$ = abe sin θ
clearly its maximum value is abe.

327. Tangents cannot be drawn from one branch of hyperbola to the other branch.
Ans. (A)

328. (d) $\sqrt{(\lambda-3)^2+16}-4=1 \Rightarrow \lambda = 0$ or 6.

329. (A)

Hyperbola is $\frac{(x-4)^2}{16}-\frac{(y-3)^2}{9}=1$

$\therefore e = \sqrt{1+\frac{9}{16}}=\frac{5}{4}$.

330. Both statements are true and statement – II is the correct reasoning for statement – I, as for any member, semi transverse and semi – conjugate axes are $\frac{a}{\alpha}$ and $\frac{b}{\alpha}$ respectively and hence asymptoters are always $y = \pm\frac{b}{a}x$.
Hence (a) is the correct answer

331. If y = mx + c be the common tangent,
then $c^2 = a^2 m^2 - b^2$ . . . (i)
and $c^2 = - b^2 m^2 + a^2$ . . . (ii)
on eliminating c^2, we get $m^2 = 1 \Rightarrow m = \pm 1$.
Now for statement – II,
On eliminating m, we get $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$,
Which is a hyperbola.
Hence (b) is the correct answer.

332. Option (D) is correct.
The statement-1 is false b′coz this will represent hyperbola if $h^2 > ab$
$\Rightarrow \frac{\lambda^2}{4}>2 \Rightarrow |\lambda| > 2\sqrt{2}$
The statmenet-2, being a standard result, is true.

333. The statement-1 is false b′coz points in region II lie below the line y = b/a x $\Rightarrow \frac{x_1^2}{a^2}-\frac{y_1^2}{b^2}>0$
The region-2 is true (standard result). Indeed for points in region II
$0<\frac{x_1^2}{a^2}-\frac{y_1^2}{b^2}<1$.

334. $x^2/a^2 - y^2/b^2 = 1$
if $c^2 = a^2m^2 - b^2$
$\Rightarrow c^2 = 3.3^2 - 2 = 25$
$c = \pm 5$

real tangents are $y = 3x + 5$ Ans (C)

335. The locus of point of intersection of two mutually perpendicular tangents drawn on to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is its director circle whose equation is $x^2 + y^2 = a^2 - b^2$. For $\frac{x^2}{9} - \frac{y^2}{16} = 1$, $x^2 + y^2 = 9 - 16$

So director circle does not exist.
So 'd' is correct.

336. $$\frac{x_1 + x_2 + x_3 + x_4}{4} = 0$$
$$\frac{y_1 + y_2 + y_3 + y_4}{4} = 0$$
So (0, 0) is average point which is also the mid point of line joining the centres of circle & rectangular hyperbola
'a' is correct.

339. The statement-1 is false. Since this will represent hyperbola if $h^2 > ab$
$$\Rightarrow \frac{\lambda^2}{4} > 2 \Rightarrow |\lambda| > 2\sqrt{2}$$
Thus reason R being a standard result is true.
(A)

340. (a)
Both Statement-1 and Statement-2 are True and Statement-2 is the correct explanation of Statement-2.

341. (A)
$$\frac{7^2}{4} - \frac{(-3)^2}{9} - 1 > 0$$
and $$\frac{2^2}{4} - \frac{7^2}{9} - 1 < 0$$

342. (B)
Required chord of contact is $32x + 9y = 144$ obtained from $\frac{xx_1}{a^2} - \frac{yy_1}{b^2} = 1$.