Conic Sections

Assertion Reason Questions

Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).
Choose the correct answer out of the following choices.
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

1. Assertion (A): A line through the focus and perpendicular to the directrix is called the x-axis of the parabola.
Reason (R): The point of intersection of parabola with axis is called the vertex of the parabola.

Ans. (d) (A) is false but (R) is true.
Explanation: A line through the focus and perpendicular to the directrix is called the axis of the parabola. The point of intersection of the parabola with the axis is called the vertex of the parabola.

2. Parabola is symmetric with respect to the axis of the parabola.
Assertion (A): If the equation of standard parabola has a term y^2, then the axis of symmetry is along the x-axis.
Reason (R): If the equation of standard parabola has a term x^2, then the axis of symmetry is along the x-axis.

Ans. (c) (A) is true but (R) is false.
Explanation: If the equation has a term y^2, then the axis of symmetry is along the x-axis and if the equation has a term x^2, then the axis of symmetry is along the y-axis.

3. Assertion (A): The eccentricity of a parabola is 1.
Reason (R): The eccentricity of a circle is greater than 1.

Ans. (c) (A) is true but (R) is false.

Explanation: The eccentricity of a parabola is exactly 1.

The eccentricity of a circle is 0.

4. Assertion (A): The parabola $y^2 = 8x$ where the value of a is 2.

Reason (R): The equation of a circle $x^2 + y^2 = 25$ having centre on + ve x-axis and radius is 5.

Ans. (c) (A) is true but (R) is false.

Explanation: The parabola $y^2 = 8x$, here $4a = 8$ or, $a = 2$

The equation of circle $x^2 + y^2 = 25$ having centre centre (0, 0) means at origin and radius is 5.

5. Assertion (A): The sum of focal distances of a point on the ellipse $9x^2 + 4y^2 - 18x - 24y + 9 = 0$ is 4.

Reason (R): The equation $9x^2 + 4y^2 - 18x - 24y + 9 = 0$ can be expressed as $9(x-1)^2 + 4(y-3)^2 = 36$.

Ans. (d) (A) is false but (R) is true.

Explanation: We have,

$$9x^2 + 4y^2 - 18x - 24y + 9 = 0$$
$$9x^2 - 18x + 9 + 24y = 0$$
$$\Rightarrow \quad 9(x-1)^2 + 4(y-3)^2 = 36$$
$$\Rightarrow \quad \frac{(x-1)^2}{2^2} + \frac{(y-3)^2}{3^2} = 1$$

Here, $b > a$

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:- Sum of focal distance of a point is $2b = 6$.

6. Assertion (A): The length of major and minor axes of the ellipse $5x^2 + 9y^2 - 54y + 360$ are 6 and, 10, respectively.

Reason (R): The equation $5x^2 + 9y^2 - 54y + 36 = 0$ can be expressed as $5x^2$

+9(y-3)² = 45.

$$\Rightarrow \qquad 5x^2 + 9(y-3)^2 = 45$$

$$\Rightarrow \qquad \frac{x^2}{3^2} + \frac{(y-3)^2}{(\sqrt{5})^2} = 1$$

∴ Length of major axis = 2 × 3 = 6

And length of minor axis = $2 \times \sqrt{5} = 2\sqrt{5}$

7. If the distance of foci and vertex of hyperbola from the centre are c and a respectively, then

Assertion (A): Eccentricity is always less than 1.

Reason (R): Focii are at a distance of ae from the centre.

Ans. (d) (A) is false but (R) is true.

Explanation: Since, cza, the eccentricity is near less than one. In terms of the eccentricity, the focii are at a distance of ae from the centre.

8. Assertion (A): The foci of the hyperbola

$9x^2 - 16y^2 = 144$ is (+5, 0).

Reason (R): The formula to find the focii of a parabola is $c^2 = a^2 + b^2$

Ans. (a) Both (A) and (R) are true and (R) is the correct explanation of (A).

Explanation: Given,

$$9x^2 - 16y^2 = 144$$

$$\frac{9x^2}{144} - \frac{16y^2}{144} = 1$$

$$\frac{x^2}{16} - \frac{y^2}{9} = 1$$

Here, $a^2 = 16$ and $b^2 = 9$

So,

$c^2 = 16 + 9 = 25$

$c = \pm 5$,

Hence, coordinate of foci is (± 5, 0)

To find the coordinate of foci we have to use

$c^2 = a^2 + b^2$.