Parabola

JEE-MAINS (PREVIOUS YEAR)

MCQ-Single Correct

1. Let P be the point on the parabola, $y^2 = 8x$ which is at a minimum distance from the centre C of the circle, $x^2 + (y+6)^2 = 1$. Then the equation of the circle, passing through C and having its centre at P is :

(1) $x^2 + y^2 - x + 4y - 12 = 0$ (2) $n = \dfrac{C_P - C}{C - C_V}$

(3) $x^2 + y^2 - 4x + 9y + 18 = 0$ (4) $x^2 + y^2 - 4x + 8y + 12 = 0$ **[2016]**

2. The centres of those circles which touch the circle, $x^2 + y^2 - 8x - 8y - 4 = 0$, externally and also touch the x-axis, lie on :

(1) an ellipse which is not a circle. (2) a hyperbola.

(3) a parabola. (4) a circle **[2016]**

3. Let O be the vertex and Q be any point on the parabola, $x^2 = 8y$. If the point P divides the line segment OQ internally in the ratio $1:3$, then the locus of P is :

(1) $y^2 = x$ (2) $y^2 = 2x$

(3) $x^2 = 2y$ (4) $x^2 = y$ **[2015]**

4. The slope of the line touching both the parabolas $y^2 = 4x$ and $x^2 = -32y$ is

(1) $\dfrac{1}{2}$ (2) $\dfrac{3}{2}$

(3) $\dfrac{1}{8}$ (4) $\dfrac{2}{3}$ **[2014]**

5. If two tangents drawn from a point P to the parabola $y^2 = 4x$ are at right angles, then the locus of P is

(1) $2x+1=0$ (2) $x=-1$

(3) $2x-1=0$ (4) $x=1$ **[2010]**

6. The area of the region bounded by the parabola $(y-2)^2 = x-1$, the tangent to the parabola at the point (2,3) and the x-axis is

(1) 3 (2) 6

(3) 9 (4) 12 **[2009]**

7. A parabola has the origin as its focus and the line x = 2 as the directrix. Then the vertex of the parabola is at

(1) (0,2) (2) (1,0)

(3) (0,1) (4) (2,0) **[2008]**

8. The locus of the vertices of the family of parabolas $y = \frac{a^3x^2}{3} + \frac{a^2x}{2} - 2a$ is

(1) $xy = \frac{105}{64}$ (2) $xy = \frac{3}{4}$

(3) $xy = \frac{35}{16}$ (4) $xy = \frac{64}{105}$ **[2006]**

9. Let P be the point (1,0) and Q a point on the locus $y^2 = 8x$. The locus of mid point of PQ is

(1) $y^2 - 4x + 2 = 0$ (2) $y^2 + 4x + 2 = 0$

(3) $x^2 + 4y + 2 = 0$ (4) $x^2 - 4y + 2 = 0$ **[2005]**

10. If $a \neq 0$ and the line $2bx + 3cy + 4d = 0$ passes through the points of intersection of the parabolas $y^2 = 4ax$ and $x^2 = 4ay$, then

(1) $d^2 + (2b+3c)^2 = 0$ (2) $d^2 + (3b+2c)^2 = 0$

(3) $d^2 + (2b-3c)^2 = 0$ (4) $d^2 + (3b-2c)^2 = 0$ **[2004]**

11. The normal at the point $\left(bt_1^{\,2}, 2bt_1\right)$ on a parabola meets the parabola again in the point $\left(bt_2^{\,2}, 2bt_2\right)$, then

(1) $t_2 = -t_1 - \frac{2}{t_1}$ (2) $t_2 = -t_1 + \frac{2}{t_1}$

(3) $t_2 = t_1 - \frac{2}{t_1}$ (4) $t_2 = t_1 + \frac{2}{t_1}$ **[2003]**

12. Two common tangents to the circle $x^2 + y^2 = 2a^2$ and parabola $y^2 = 8ax$ are

(1) $x = \pm\left(y + 2a\right)$ (2) $y = \pm\left(x + 2a\right)$

(3) $x = \pm\left(y + a\right)$ (4) $y = \pm\left(x + a\right)$ **[2002]**

Assertion-Reason Type

(1) Statement-I is True; Statement-II is true; Statement-II is **not** a correct explaination of Statement-I.
(2) Statement-I is True; Statement-II is False.
(3) Statement-I is False; Statement-II is true
(4) Statement-I is True; Statement-II is true; Statement-II is a **correct** explaination of Statement-I.

1. Given : A circle, $2x^2+2y^2=5$ and a parabola, $y^2=4\sqrt{5}x$.

Statement-I : An equation of a common tangent to these curves is $y=x+\sqrt{5}$

Statement-II : If the line, $y=mx+\dfrac{\sqrt{5}}{m}\ (m\neq 0)$ is their common tangent, then m satisfies $m^4-3m^2+2=0$

2. **Statement-I** : An equation of a common tangent to the parabola $y^2=16\sqrt{3}x$ and the ellipse $2x^2+y^2=4$ is $y=2x+2\sqrt{3}$.

Statement-II : If the line $y=mx+\dfrac{4\sqrt{3}}{m},\ (m\neq 0)$ is a common tangent to the parabola $y^2=16\sqrt{3}x$ and ellipse $2x^2+y^2=4$, then m satisfies $m^4+2m^2=24$.

3. Let the tangent to the parabola be $y=mx+\dfrac{\sqrt{5}}{m},\ (m\neq 0)$.

Now, its distance from the centre of the circle must be equal to the radius of the circle.

So, $\left|\dfrac{\sqrt{5}}{m}\right|=\dfrac{\sqrt{5}}{\sqrt{2}}\sqrt{1+m^2}\Rightarrow (1+m^2)m^2=2\Rightarrow m^4+m^2-2=0$

$\Rightarrow (m^2-1)(m^2+2)=0\Rightarrow m=\pm 1$

So, the common tangents are $y=x+\sqrt{5}$ and $y=-x-\sqrt{5}$.