

Assignment 1

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D: Single Correct

- 1) Circle(s) touching the x-axis at a distance (3) from the origin and having an intercept of length $2\sqrt{7}$ on the y-axis is (are)

(JEEAdv.2013)

- a) $x^2 + y^2 - 6x + 8y + 9 = 0$
- b) $x^2 + y^2 - 6x + 7y + 9 = 0$
- c) $x^2 + y^2 - 6x - 8y + 9 = 0$
- d) $x^2 + y^2 - 6x - 7y + 9 = 0$

- 2) A circle S passes through the point $(0, 1)$ and is orthogonal to the circle $(x - 1)^2 + y^2 = 16$ and $x^2 + y^2 = 1$. Then

(JEEAdv.2014)

- a) Radius of S is 8
- b) Radius of S is 7
- c) Centre of S is $(-7, 1)$
- d) Centre of S is $(-8, 1)$

- 3) Let RS be the diameter of the Circle $x^2 + y^2 = 1$, where S is the point $(1, 0)$. Let P be a variable point (other than R and S) on the circle and tangents to the circle at S and P meet at the point Q . The normal to the circle at P intersects a line drawn through Q parallel to RS at point E . Then the locus of E passes through the point(s)

(JEEAdv.2016)

- a) $\left(\frac{1}{3}, \frac{1}{\sqrt{3}}\right)$
- b) $\left(\frac{1}{4}, \frac{1}{2}\right)$
- c) $\left(\frac{1}{3}, -\frac{1}{\sqrt{3}}\right)$
- d) $\left(\frac{1}{4}, -\frac{1}{2}\right)$

- 4) Let T be a line passing through the points $P(-2, 7)$ and $Q(2, -5)$. Let F_1 be the set of all pairs of circles (S_1, S_2) such that T is tangent to S_1 at P and tangent to S_2 at Q , and also such that S_1 and S_2 touch each other at a point, say M . Let E_1 be the set representing the locus of M as the pair (S_1, S_2) varies in F_1 . Let the set of all straight line segments joining a pair of distinct points of E_1 and passing through the point $R(1, 1)$ be F_2 . Then which of the

following statements is (are) TRUE?

(JEEAdv.2018)

- a) The point $(-2, 7)$ lies on E_1
- b) The point $\left(\frac{4}{5}, \frac{7}{5}\right)$ does **NOT** lie on E_1
- c) The point $\left(\frac{1}{3}, 1\right)$ lies on E_1
- d) The point $\left(0, \frac{3}{2}\right)$ does not lie on E_1

E: Subjective

- 1) Find the equation of the circle whose radius is 5 and which touches the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ at the point $(5, 5)$

(1978)

- 2) Let A be the centre of circle $x^2 + y^2 - 2x - 4y - 20 = 0$. Suppose that the tangents at the points $B(1, 7)$ and $D(4, -2)$ on the circle meet at point C . Find the area of the quadrilateral $ABCD$.

(1981 - 4marks)

- 3) Find the equations of the circle passing through $(-4, 3)$ and touching the lines $x + y = 2$ and $x - y = 2$

(1981 - 4marks)

- 4) Through a fixed point (h, k) secants are drawn to the circle $x^2 + y^2 = r^2$. Show that the locus of the mid-points of the secants intercepted is $x^2 + y^2 = hx + ky$

(1983 - 5marks)

- 5) The abscissa of two points A and B are roots of the equation $x^2 + 2ax - b^2 = 0$ and their ordinates are roots of the equation $x^2 + 2px - q^2 = 0$. Find the equation and the radius of the circle with AB as diameter.

(1984 - 4marks)

- 6) Lines $5x + 12y - 10 = 0$ and $5x - 12y - 40 = 0$ touch a Circle C_1 of diameter 6. If the centre of C_1 lies in the first quadrant, find the equation of circle C_2 which is concentric with C_1 and cuts intercepts of length 8 on these lines

(1986 - 5marks)

- 7) Let a given Line L_1 intersects the x and y axes at P and Q respectively. Let another line L_2 , perpendicular to L_1 , cut the x and y axes at R and S , respectively. Show that the locus of the

point of intersection of PS and QR is a circle passing through origin.

(1987 – 3marks)

- 8) The circle $x^2 + y^2 - 4x - y + 4 = 0$ is inscribed in a triangle which has two of its sides along the co-ordinate axes. The locus of circumcentre of the triangle is $x + y - xy + k(x^2 + y^2)^{1/2}$. Find k .

(1987 – 4marks)

- 9) If $(m_i, \frac{1}{m_i})$, $m_i > 0$, $i = 1, 2, 3, 4$ are four distinct points on a circle, then show that $m_1 m_2 m_3 m_4 = 1$

(1989 – 2marks)

- 10) A circle touches the line $y = x$ at a point P such that $OP = 4\sqrt{2}$, where O is the origin. The circle contains the point $(-10, 2)$ in its interior and the length of its chord on the line $x + y = 0$ is $6\sqrt{2}$. Determine the equation of circle.

(1990 – 5marks)

- 11) Two circles, each of radius 5 units, touch each other at $(1, 2)$. If the equation of common tangent is $4x + 3y = 10$, find the equations of circles.

(1991 – 4marks)