1. Sum of the abscissa and ordinate of the centre of the circle touching the line $3x + y + 2 = 0$ at the point $(-1,1)$ and passing through the point $(3,5)$ is-

(A) 2 (B) 3 (C) 4 (D) 5

2. Consider 3 non collinear points A, B, C with coordinates (0, 6), (5, 5) and (–1, 1) respectively. Equation of a line tangent to the circle circumscribing the triangle ABC and passing through the origin is

(A) $2x - 3y = 0$ (B) $3x + 2y = 0$ (C) $3x - 2y = 0$ (D) $2x + 3y = 0$

3. In the xy-plane, the length of the shortest path from (0, 0) to (12, 16) that does not go inside the circle $(x - 6)^2 + (y - 8)^2 = 25$ is

(A) $10\sqrt{3}$ (B) $10\sqrt{5}$ (C) $10\sqrt{3}+\frac{5\pi}{3}$ (D) $10+5\pi$

4. The line $2x - y + 1 = 0$ is tangent to the circle at the point (2, 5) and the centre of the circles lies on $x - 2y = 4$. The radius of the circle is

(A) $3\sqrt{5}$ (B) $5\sqrt{3}$ (C) $2\sqrt{5}$ (D) $5\sqrt{2}$

5. If the curve $y = 1+\sqrt{4-x^2}$ and the line $y = (x - 2)k + 4$ has two distinct points of intersection then the range of k, is

(A) [1, 3] (B) $\left[\frac{5}{12}, \infty\right)$ (C) $\left[\frac{5}{12}, \frac{3}{4}\right]$ (D) $\left(\frac{5}{12}, \infty\right)$

6. The angle between the two tangents from the origin to the circle $(x - 7)^2 + (y + 1)^2 = 25$ equals

(A) $\pi/6$ (B) $\pi/3$ (C) $\pi/2$ (D) $\pi/4$

7. The lengths of the tangents from any point of the circle $15x^2 + 15y^2 - 48x + 64y = 0$ to the two circles $5x^2 + 5y^2 - 24x + 32y + 75 = 0$, $5x^2 + 5y^2 - 48x + 64y + 300 = 0$ are in the ratio :

(A) 1 : 2 (B) 2 : 3 (C) 3 : 4 (D) 1 : 4

8. Tangents are drawn to a unit circle with centre at the origin from each point on the line $2x + y = 4$. Then the equation to the locus of the middle point of the chord of contact is -

(A) $2(x^2 + y^2) = x + y$ (B) $2(x^2 + y^2) = x + 2y$ (C) $4(x^2 + y^2) = 2x + y$ (D) none

9. If tangent at (1, 2) to the circle $c_1 : x^2 + y^2 = 5$ intersects the circle $c_2 : x^2 + y^2 = 9$ at A and B and tangents at A and B to the second circle meet at point C, then the co-ordinates of C are :

(A) (4, 5) (B) (9/15, 18/5) (C) (4, –5) (D) (9/5, 18/5)

[MORE THAN ONE ANSWER TYPE]

10. A circle passes through the points (–1, 1), (0, 6) and (5, 5). The point(s) on this circle, the tangent(s) at which is/are parallel to the straight line joining the origin to its centre is/are :

(A) (1, –5) (B) (5, 1) (C) (–5, –1) (D) (–1, 5)

11. Tangents PA and PB are drawn to the circle $S \equiv x^2 + y^2 - 2y - 3 = 0$ from the point P(3,4). Which of the following alternative(s) is/are correct ?

(A) The power of point P(3,4) with respect to circle $S = 0$ is 14.

(B) The angle between tangents from P(3,4) to the circle $S = 0$ is $\frac{\pi}{3}$

(C) The equation of circumcircle of ΔPAB is $x^2 + y^2 - 3x - 5y + 4 = 0$

(D) The area of quadrilateral PACB is $3\sqrt{7}$ square units where C is the centre of circle $S = 0$.

12. Find the equation of the tangent to the circle

(a) $x^2 + y^2 - 6x + 4y = 12$, which are parallel to the straight line $4x + 3y + 5 = 0$.

(b) $x^2 + y^2 - 22x - 4y + 25 = 0$, which are perpendicular to the straight line $5x + 12y + 9 = 0$

(c) $x^2 + y^2 = 25$, which are inclined at 30° to the axis of x.

13. If the length of the tangent form a point (f, g) to the circle $x^2 + y^2 = 4$ be four times the length of the tangent from it to the circle $x^2 + y^2 = 4x$, find the value of $64f - 15(g^2 + f^2)$.

14. Tangents OP and OQ are drawn from the origin O to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$. Find the equation of the circumcircle of the triangle OPQ.

15. Find the equations of the tangents to the circle $x^2 + y^2 - 6x - 4y + 5 = 0$, which make an angle of 45° with the axis of x.

16. From any point on the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ tangent are drawn to the circle $x^2 + y^2 + 2gx + 2fy + c\sin^2\alpha + (g^2 + f^2)\cos^2\alpha = 0$. Find the angle between them.

17. Show that the line $3x - 4y - c = 0$ will meet the circle having centre at (2, 4) and the radius 5 in real and distinct points if $-35 < c < 15$.

18. A foot of the normal from the point (4, 3) to a circle is (2, 1) and a diameter of the circle has the equation $2x - y - 2 = 0$. Then the equation of the circle is

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

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

19. To which of the following circles, the line $y - x + 3 = 0$ is normal at the point $\left(3+\frac{3}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$?

(A) $\left(x-3-\frac{3}{\sqrt{2}}\right)^2+\left(y-\frac{3}{\sqrt{2}}\right)^2=9$ (B) $\left(x-\frac{3}{\sqrt{2}}\right)^2+\left(y-\frac{3}{\sqrt{2}}\right)^2=9$

(C) $x^2 + (y - 3)^2 = 9$ (D) $(x - 3)^2 + y^2 = 9$

20. The smallest distance between the circle $(x - 5)^2 + (y + 3)^2 = 1$ and the line $5x + 12y - 4 = 0$, is

(A) 1/13 (B) 2/13 (C) 3/15 (D) 4/15

21. If $x = 3$ is the chord of the contact of the circle $x^2 + y^2 = 81$, then the equation of the corresponding pair of tangents, is

(A) $x^2 - 8y^2 + 54x + 729 = 0$ (B) $x^2 - 8y^2 - 54x + 729 = 0$

(C) $x^2 - 8y^2 - 54x - 729 = 0$ (D) $x^2 - 8y^2 = 729$

22. Tangents are drawn from (4, 4) to the circle $x^2 + y^2 - 2x - 2y - 7 = 0$ to meet the circle at A and B. The length of the chord AB is

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

23. The distance between the chords of contact of tangents to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ from the origin and the point (g, f) is

(A) $\sqrt{g^2+f^2}$ (B) $\frac{\sqrt{g^2+f^2-c}}{2}$ (C) $\frac{g^2+f^2-c}{2\sqrt{g^2+f^2}}$ (D) $\frac{\sqrt{g^2+f^2+c}}{2\sqrt{g^2+f^2}}$

Answers

RACE # 50

1. (C) **2.** (D) **3.** (C) **4.** (A) **5.** (D) **6.** (A) **7.** (A) **8.** (C) **9.** (D) **10.** (BD)
11. (AC)

12. (a) $4x + 3y + 19 = 0$ and $4x + 3y - 31 = 0$; (b) $12x - 5y + 8 = 0$ and $12x - 5y - 252 = 0$, (c) $x - \sqrt{3}y + 10 = 0$

13. 4 **14.** $x^2 + y^2 + gx + fy = 0$ **15.** $y = x + 3$, $y = x - 5$ **16.** 2α **18.** (C) **19.** (D)
20. (B) **21.** (B) **22.** (B) **23.** (C)