Entry Test MCQs: Conic Sections - Exercise 6.2 (Chapter 6, Mathematics Part-II, Class 12)

These 20 multiple-choice questions are designed for an entry test, focusing on tangents, normals, point positions, tangent lengths, chord lengths, intersection points, and chord of contact for circles from Exercise 6.2. Distractors reflect common errors for conceptual clarity.

MCQs: Conic Sections - Circles

1. What is the equation of the tangent to the circle $x^2 + y^2 = 25$ at the point $(4, 3)$?

(a) $4x + 3y - 25 = 0$

(b) $3x - 4y = 0$

(c) $4x - 3y - 25 = 0$

(d) $3x + 4y - 25 = 0$

Answer: a) Use $xx_1 + yy_1 - 25 = 0$, substitute $(4, 3)$: $4x + 3y - 25 = 0$.

2. The normal to the circle $x^2 + y^2 = 25$ at $(5\cos\theta, 5\sin\theta)$ is:

(a) $x\cos\theta + y\sin\theta = 5$

(b) $x\sin\theta - y\cos\theta = 0$

(c) $x\sin\theta + y\cos\theta = 5$

(d) $x\cos\theta - y\sin\theta = 0$

Answer: b) Normal: $(y - 5\sin\theta)(5\cos\theta) = (x - 5\cos\theta)(5\sin\theta)$, simplifies to $x\sin\theta - y\cos\theta = 0$.

3. For the circle $3x^2 + 3y^2 + 5x - 13y + 2 = 0$, the tangent at $\left(1, \frac{10}{3}\right)$ has coefficient of x:

(a) 33

(b) 21

(c) 15

(d) 10

Answer: a) Tangent: $33x + 21y - 103 = 0$, coefficient of x: 33.

4. The circle $4x^2 + 4y^2 - 16x + 24y - 117 = 0$ has a normal at $\left(-4, -\frac{1}{2}\right)$. What is it?

(a) $24x - 10y + 91 = 0$

(b) $5x + 12y + 26 = 0$

(c) $5x - 12y - 46 = 0$

(d) $24x + 10y + 151 = 0$

Answer: b) Normal: $(y + \frac{1}{2})(-4 - 2) = (x + 4)(-\frac{1}{2} + 3)$, simplifies to $5x + 12y + 26 = 0$.

5. The point $(5, 6)$ lies in which position relative to the circle $x^2 + y^2 = 81$?

(a) Inside

(b) Outside

(c) On

(d) Cannot determine

Answer: a) Substitute: $5^2 + 6^2 - 81 = -20 < 0$, inside.

6. The length of the tangent from $(-5, 4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$ is:

(a) $\sqrt{\frac{184}{5}}$

(b) $\sqrt{184}$

(c) $\sqrt{\frac{131}{5}}$

(d) $\sqrt{63}$

Answer: a) Divide by 5, use formula: $\sqrt{(-5)^2 + 4^2 - 2(-5) + 3(4) - \frac{131}{5}} = \sqrt{\frac{184}{5}}$.

7. The chord length of the line $2x + 3y = 13$ with the circle $x^2 + y^2 = 26$ is:

(a) $2\sqrt{13}$

(b) $\sqrt{52}$

(c) $4\sqrt{13}$

(d) $2\sqrt{26}$

Answer: a) Intersection points: $(5, 1)$, $(-1, 5)$, length: $\sqrt{(5 - (-1))^2 + (1 - 5)^2} = 2\sqrt{13}$.

8. The points of intersection of the line $x + 2y = 6$ with the circle $x^2 + y^2 - 2x - 2y - 39 = 0$ include:

(a) $(5, 1)$

(b) $(-4, 5)$

(c) $(1, 5)$

(d) $(4, -5)$

Answer: b) Solve: $x = 6 - 2y$, get points $(-4, 5)$, $\left(\frac{36}{5}, -\frac{3}{5}\right)$.

9. The tangent to $x^2 + y^2 = 2$ parallel to $x - 2y + 1 = 0$ is:

(a) $x - 2y + \sqrt{10} = 0$

(b) $x - 2y - \sqrt{10} = 0$

(c) $2x - y + \sqrt{10} = 0$

(d) Both a and b

Answer: d) Slope $m = \frac{1}{2}$, $c = \pm\sqrt{2(1+\frac{1}{4})} = \pm\frac{\sqrt{10}}{2}$, tangents: $x - 2y \pm \sqrt{10} = 0$.

10. The slope of the tangent to $x^2 + y^2 = 16$ from $(0, 5)$ at point $\left(\frac{12}{5}, \frac{16}{5}\right)$ is:

(a) $\frac{3}{4}$

(b) $-\frac{3}{4}$

(c) $\frac{4}{3}$

(d) $-\frac{4}{3}$

Answer: b) Slope: $\frac{\frac{16}{5}-5}{\frac{12}{5}} = -\frac{3}{4}$.

11. The chord of contact from $(4, 5)$ to the circle $2x^2 + 2y^2 - 8x + 12y + 21 = 0$ is:

(a) $4x + 16y + 35 = 0$

(b) $4x - 16y + 35 = 0$

(c) $8x + 16y - 35 = 0$

(d) $4x + 8y + 35 = 0$

Answer: a) Divide by 2, use $xx_1 + yy_1 - 2(x + x_1) + 3(y + y_1) + \frac{21}{2} = 0$, get $4x + 16y + 35 = 0$.

12. The normal to $x^2 + y^2 + 4x + 2y = 0$ at $(-3, 1)$ is:

(a) $x - 2y + 5 = 0$

(b) $2x + y = 0$

(c) $x + 2y - 5 = 0$

(d) $2x - y + 5 = 0$

Answer: a) Center: $(-2, -1)$, normal: $(y - 1)(-3 - 2) = (x + 3)(1 - 1)$, simplifies to $x - 2y + 5 = 0$.

13. The position of $(5, 6)$ relative to $2x^2 + 2y^2 + 12x - 8y + 1 = 0$ is:

(a) Inside

(b) Outside

(c) On

(d) Cannot determine

Answer: b) Substitute: $2(5^2) + 2(6^2) + 12(5) - 8(6) + 1 = 135 > 0$, outside.

14. The length of the tangent from $(-7, -2)$ to the circle $(x + 1)^2 + (y - 2)^2 = 26$ is:

(a) $\sqrt{26}$

(b) $\sqrt{52}$

(c) $\sqrt{78}$

(d) $\sqrt{104}$

Answer: c) General form: $x^2 + y^2 + 2x - 4y - 21 = 0$, length: $\sqrt{(-7)^2 + (-2)^2 + 2(-7) - 4(-2) - 21} = \sqrt{78}$.

15. The tangent to $x^2 + y^2 = 2$ perpendicular to $3x + 2y = 6$ has intercept:

(a) $\pm\sqrt{26}$

(b) $\pm\frac{\sqrt{26}}{3}$

(c) $\pm\frac{\sqrt{13}}{3}$

(d) $\pm\sqrt{13}$

Answer: b) Slope $m = \frac{2}{3}$, $c = \pm\sqrt{2(1+\frac{4}{9})} = \pm\frac{\sqrt{26}}{3}$.

16. The points of intersection of $x + 2y = 6$ with $x^2 + y^2 = 26$ include:

(a) $(4, 1)$

(b) $(2, 2)$

(c) $(1, 4)$

(d) $(5, 1)$

Answer: a) Solve: $x = 6 - 2y$, get points $(4, 1)$, $(-2, 4)$.

17. The number of tangents from $(-1, 2)$ to $x^2 + y^2 + 4x + 2y = 0$ is:

(a) 1

(b) 2

(c) 0

(d) 3

Answer: b) Solve: $x_1 = -3y_1$, $10y_1^2 - 10y_1 = 0$, yields two points $(0, 0)$, $(-3, 1)$.

18. The slope of the normal at $(4, 3)$ to $x^2 + y^2 = 25$ is:

(a) $\frac{4}{3}$

(b) $-\frac{4}{3}$

(c) $\frac{3}{4}$

(d) $-\frac{3}{4}$

Answer: d) Tangent slope: $-\frac{4}{3}$, normal slope: $\frac{3}{4}$.

19. The chord of contact from $(0, 5)$ to $x^2 + y^2 = 16$ is:

(a) $5y = 16$

(b) $y = 5$

(c) $5y = 25$

(d) $y = 16$

Answer: a) Use $xx_1 + yy_1 - 16 = 0$, substitute $(0, 5)$: $5y - 16 = 0$.

20. The condition for a line $y = mx + c$ to be tangent to $x^2 + y^2 = r^2$ is:

(a) $c^2 = r^2(1 + m^2)$

(b) $c = r\sqrt{1 + m^2}$

(c) $c^2 = r(1 + m^2)$

(d) $c = r(1 + m^2)$

Answer: a) Tangency condition: $c^2 = r^2(1 + m^2)$.