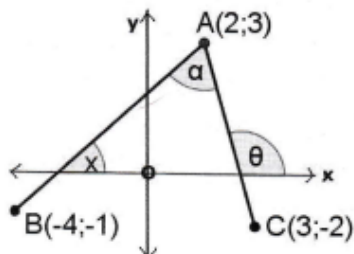


ANALYTICAL GEOMETRY NOTES

MODULE 9: Analytical Geometry

1. **Gradient:** $m = \frac{y_2 - y_1}{x_2 - x_1}$
2. **Distance between two points:** $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
3. **Coordinates of midpoint:** $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
4. **Equation of line:** $y = mx + c$ or $y - y_1 = m(x - x_1)$
5. **Inclination of line:** $\tan \theta = m$
(angle between line and positive x -axis)
6. **Collinear points:** A, B, C : $m_{AB} = m_{BC}$
7. **Parallel lines:** $m_1 = m_2$
8. **Perpendicular lines:** $m_1 \times m_2 = -1$
9. **Median:** Line joining a vertex to the **midpoint** of the opposite side.
(bisects the area of a Δ)
10. **Altitude:** Line from vertex, **perpendicular** to opposite side.
11. **Perpendicular bisector:** perpendicular line through midpoint.
12. **Parallelogram:** both pairs of opp. sides \parallel
13. **Rhombus:** parallelogram with one pair of adjacent sides =
14. **Rectangle:** parallelogram with one angle = 90°
15. **Trapezium:** quadrilateral with one pair of opp. sides \parallel

Determine the size of α



1. $m_{AC} = \frac{5}{-1} \therefore \tan \theta = -5$
 $\therefore \theta = 180^\circ - 78,69^\circ$
 $= 101,309^\circ$
2. $m_{AB} = \frac{4}{6} \therefore \tan x = \frac{2}{3}$
 $\therefore x = 33,69^\circ$
3. $\therefore \alpha = 101,30^\circ - 33,68^\circ$
 $= 67,6^\circ$ (ext. $\angle \Delta$)

4. **Given, the equation of the circle.**
Find the centre and the radius of the circle.

Given: $x^2 - 8x + y^2 - 10y - 59 = 0$

1. Leave space for completing the square:

$$x^2 - 8x + \dots + y^2 - 10y + \dots = 59$$

2. **Complete the square:**

$$x^2 - 8x + \mathbf{16} + y^2 - 10y + \mathbf{25} = 59 + \mathbf{16} + \mathbf{25}$$

3. Write in **centre-radius equation** form:

$$(x - \mathbf{4})^2 + (y - \mathbf{5})^2 = 100$$

\therefore centre = (4;5)

radius = 10

5. **Determine the equation of the tangent to a circle.**

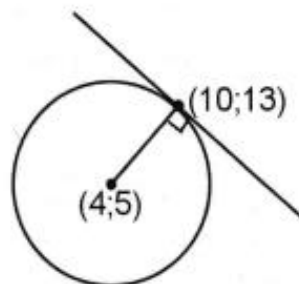
$x^2 - 8x + y^2 - 10y - 59 = 0$ at the point (10;13).

1. Determine the centre of the circle as in example 4.

$$\therefore (x - 4)^2 + (y - 5)^2 = 100$$

\therefore Centre = (4;5)

Point (10;13)



2. $m_{\text{radius}} = \frac{8}{6} = \frac{4}{3}$

tangent \perp radius
 $m_1 \times m_2 = -1$

3. $\therefore m_{\text{tangent}} = -\frac{3}{4}$

4. \therefore equation_{tangent}: $y - 13 = -\frac{3}{4}(x - 10)$
 $y = -\frac{3}{4}x + 20\frac{1}{2}$