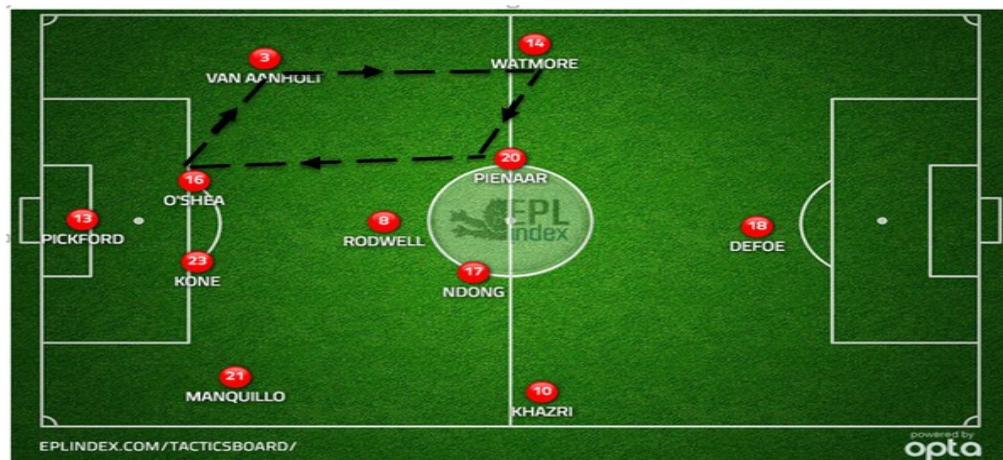


ANALYTICAL GEOMETRY

FREE STATE

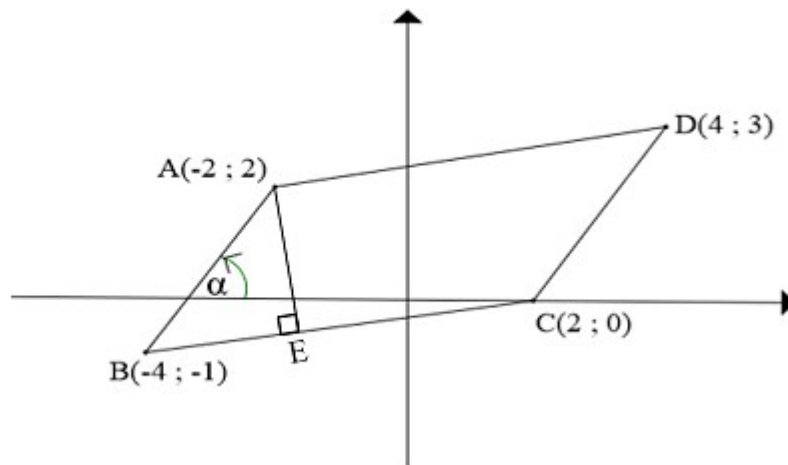
QUESTION 1



The picture above shows the inter passes amongst four Sunderland players in a premier league match.

Source: <http://www.soccermetrica.com/tactics/>

The diagram below, NOT drawn to scale, models the above situation in a Cartesian plane. The diagram below is a parallelogram with vertices $A(-2 ; 2)$; $B(-4 ; -1)$; $C(2 ; 0)$ and $D(4 ; 3)$. α is the angle which AB forms with the x -axis



Determine:

- 1.1 the length of CD. (Leave your answer in simplified surd form). (3)
- 1.2 the equation of straight line CD in the form $y = mx + c$ (4)

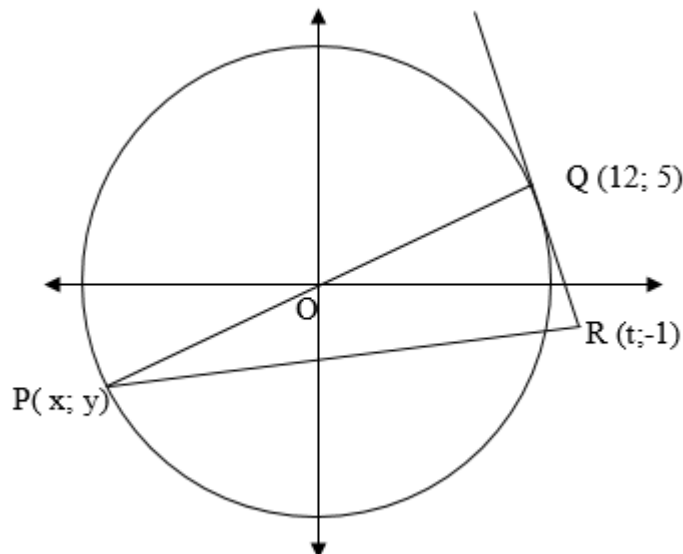
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ANALYTICAL GEOMETRY

- 1.3 the gradient of AB. (1)
1.4 the size of α rounded off to two decimal places. (3)
1.5 the coordinates of O, the point of intersection of the diagonals of ABCD. (3)
[14]

QUESTION 2

- 2.1 O is the centre of the circle in the figure below. $P(x,y)$ and $Q(12,5)$ are two points on the circle. POQ is a straight line. The point $R(t,-1)$ lies on the tangent to the circle at Q.



- 2.1.1 Determine the equation of the circle. (3)
2.1.2 Determine the equation of the straight line through P and Q. (2)
2.1.3 Show that the gradient of QR is $-\frac{12}{5}$. (2)
2.1.4 Calculate the value of t. (3)
2.2 Sketch the graph defined by $\frac{x^2}{9} + \frac{y^2}{49} = 1$, clearly show all the intercepts with the axes. (3)

[13]

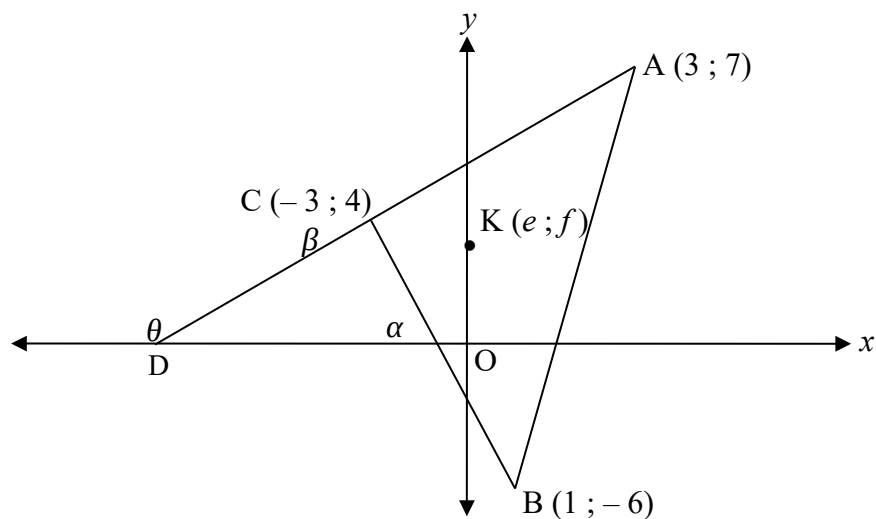
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ANALYTICAL GEOMETRY

GAUTENG

QUESTION 1

In the given diagram $A(3; 7)$, $B(1; -6)$ and $C(-3; 4)$ are the vertices of $\triangle ABC$. D is the x -intercept of the straight line AD . $K(e; f)$ is a point in the first quadrant of the Cartesian Plane with $e > 0$ and $f > 0$. α and θ are the angles of inclination of lines BC and AD respectively, and $\widehat{DCB} = \beta$.



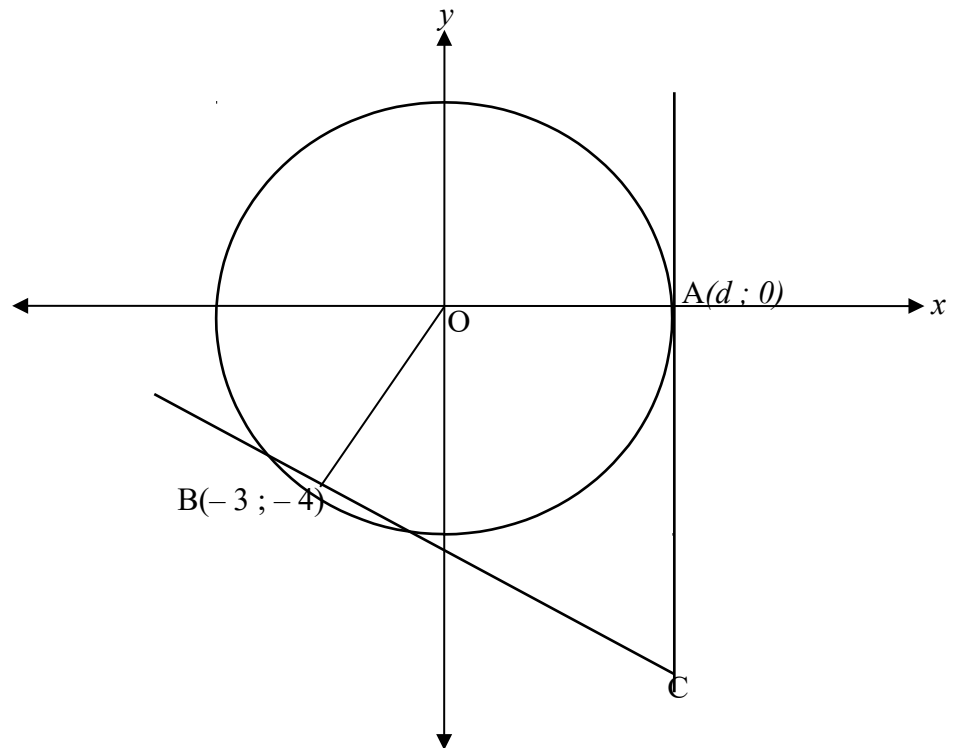
- 1.1 Determine the coordinates of the midpoint of BC. (2)
- 1.2 Determine the gradient of AD. (2)
- 1.3 Determine the equation of AD. (3)
- 1.4 Given: The gradient of line BC is equal to $\frac{-5}{2}$
 - 1.4.1 Show that $\alpha = 111,80^\circ$. (2)
 - 1.4.2 Determine the value of β . (2)
- 1.5 If $f = 2e + 1$ and $KC = \sqrt{17}$, determine the possible value(s) of f . (5)

ANALYTICAL GEOMETRY

[16]

QUESTION 2

- 2.1 In the given diagram $O(0 ; 0)$ is the centre of the circle with equation $x^2 + y^2 = 25$. CA and CB are tangents to the circle at $A(d ; 0)$ and $B(-3 ; -4)$ respectively.



- 2.1.1 Write down the value of d . (1)
- 2.1.2 Why is $OA = OB$? (1)
- 2.1.3 Show that the equation of tangent BC is $3x + 4y + 25 = 0$. (4)
- 2.1.4 Determine the coordinates of the point C. (3)

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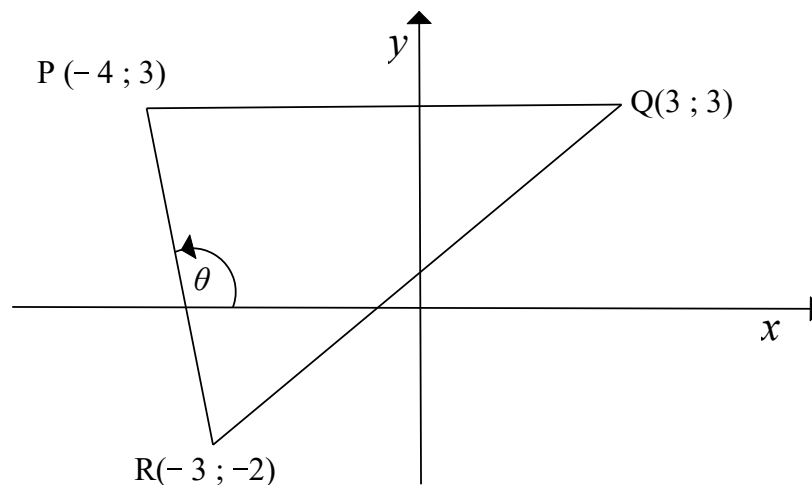
ANALYTICAL GEOMETRY

- 2.2 Sketch the graph of the ellipse defined by $4x^2 + 9y^2 = 36$. Clearly indicate ALL intercepts with the axes. (3)
[12]

LIMPOPO

QUESTION 1

In the figure, $P(-4; 3)$, $Q(3; 3)$ and $R(-3; -2)$ are vertices of $\triangle PQR$ in a Cartesian plane. θ is an angle which PR makes with the x -axis.



- 1.1 Write down the equation of PQ. (1)
1.2 Determine the coordinates of the M, the midpoint of QR. (2)
1.3 Determine the size of θ . (4)

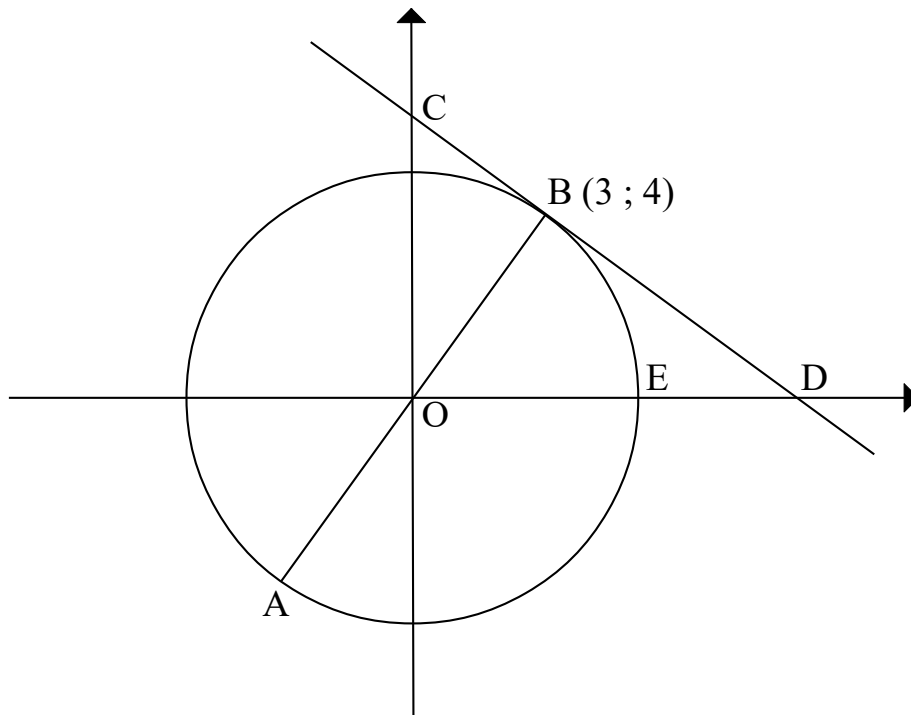
[7]

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ANALYTICAL GEOMETRY

QUESTION 2

- 2.1 O is the centre of circle in the figure below. $B(3; 4)$, A and E are points on the circle. AOB is a straight line. CD is a tangent to the circle at point B.



- 2.1.1 Write down the coordinates of A. (2)
- 2.1.2 Determine the equation of the circle. (3)
- 2.1.3 Write down the length of OE (1)
- 2.1.4 Determine the gradient OB. (2)
- 2.1.5 Complete the following: $m_{OB} \times m_{CD} \dots$ (1)
- 2.1.6 Determine the equation of the tangent, CD. (4)

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ANALYTICAL GEOMETRY

2.1.7 Determine the coordinates of C and D.

(3)

2.2 Use **DIAGRAM SHEET** provided to draw the following ellipse:

$$\frac{2x^2}{8} + \frac{2y^2}{50} = 1$$

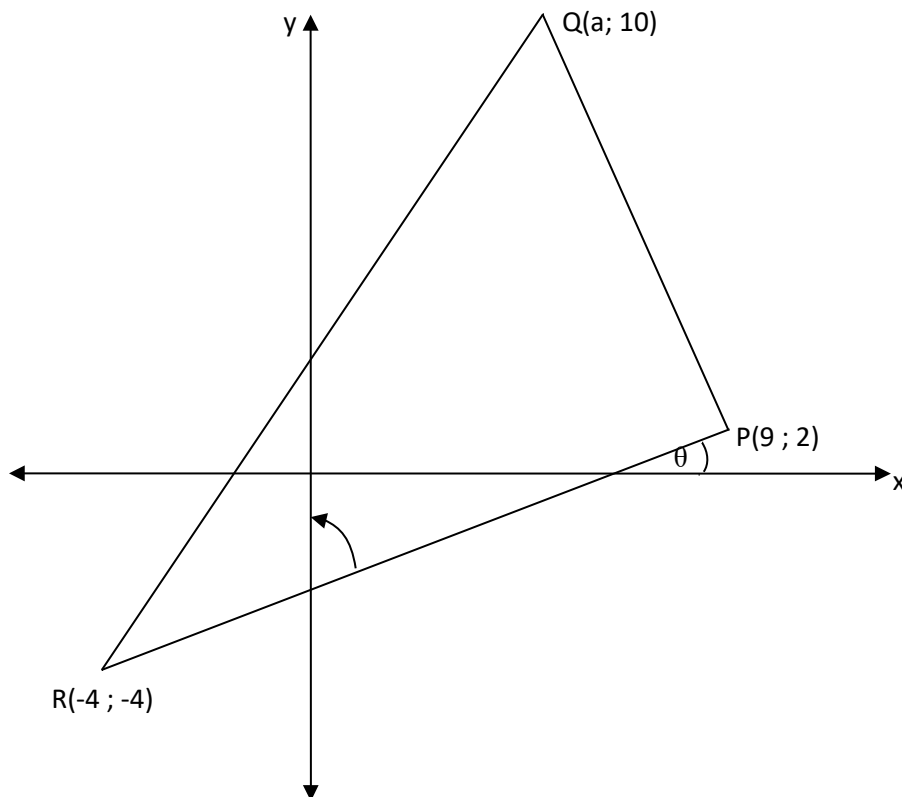
(4)
[20]

NORTH WEST

QUESTION 1

In the diagram below, $P(9; 2)$; $Q(a; 10)$ and $R(-4; -4)$ are the vertices of $\triangle PQR$.

α is the angle between y-axis and the line PR.



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ANALYTICAL GEOMETRY

- 1.1 Determine the gradient of PR (3)
- 1.2 Calculate the size of α , angle between y-axis and the line PR (4)
- 1.3 Show that the value of $a = 5$ if $PQ = 4\sqrt{5}$ units and $Q(a; 10)$ (6)
- 1.4 Determine the equation of a line parallel PR and passing through Q (3)
- 1.5 Calculate the coordinates of $S(x; y)$, if PQSR is a parallelogram and S is a point in the second quadrant. (4)

[20]

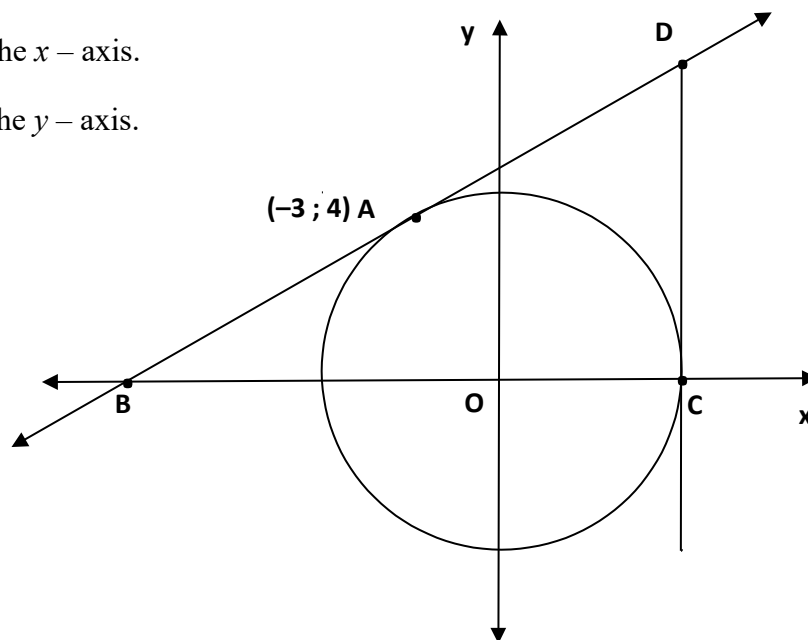
QUESTION 2

- 2.1 The circle with the centre at the origin, passes through $A(-3; 4)$ and cuts the x – axis at C.

BD is a tangent to the circle A.

B is the point on the x – axis.

CD is parallel to the y – axis.



- 2.1.1 Determine the equation of the circle. (3)

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ANALITYCAL GEOMETRY

2.1.2 Write the coordinates of C. (2)

2.1.3 Calculate the gradient of BD. (3)

2.1.4 Hence, determine the equation of BD. (3)

2.1.5 Determine the length of CD. (2)

2.2 Sketch the graph defined by:

$$\frac{x^2}{5} + \frac{y^2}{16} = 1$$

Clearly show ALL the intercepts with the axes. (3)

[16]