ANALYTICAL GEOMETRY I

29 JULY 2013

Lesson Description

In this lesson, we:

- Apply the concepts of distance formula, mid-point formula, gradient and inclination to prove various concepts using analytical methods.
- Find the equation of a circle with centre off the origin
- Apply analytical methods to solve questions involving circles.

Key Concepts

The Distance Formula

$AB^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$

The Mid-Point Formula

$\dfrac{x_1 - x_2}{2} ; \dfrac{y_1 - y_2}{2}$

The Gradient of a Line

$m = \dfrac{y_1 - y_2}{x_1 - x_2}$

Inclination of a Line

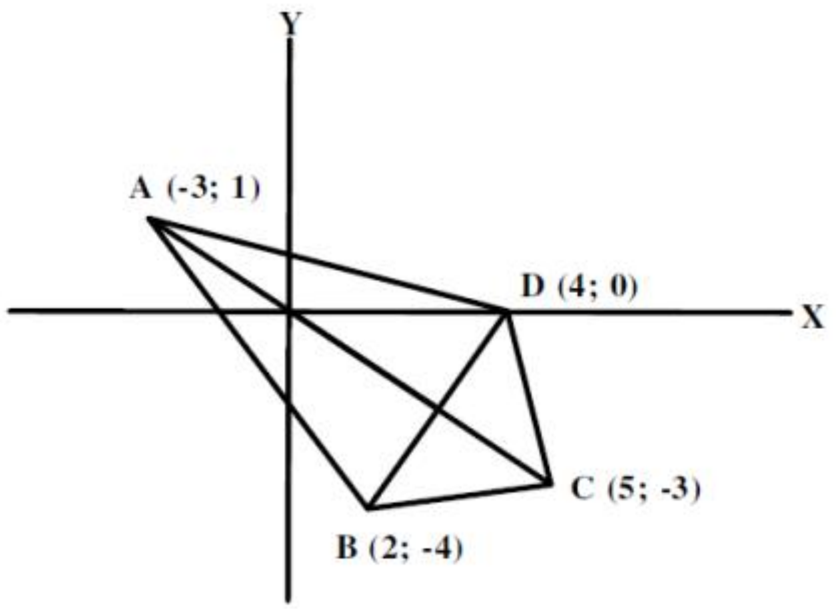
$tan\theta = m$

Equation of Circle with Centre (m ; n)

$(x - m)^2 + (y - n)^2 = r^2$

Questions

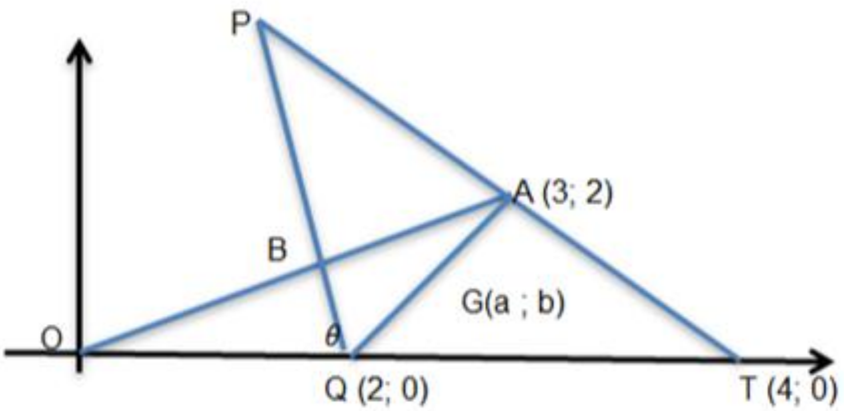
Question 1



a.) Calculate the length of AC and leave your answer in simplest surd form.
b.) Determine the equation of the line AC.
c.) Show that AC is the perpendicular bisector of DB if the equation on DB is given as $y = 2x - 8$
d.) Determine the area of the kite ABCD.
e.) Calculate the inclination of AB.
f.) Hence, or otherwise, calculate the size of $B\hat{A}D$

Question 2

In the diagram, which is not drawn to scale, A is the midpoint of the line segment TP. $O\hat{Q}A = \theta$ and $PQ \perp OA$.



Determine:

a.) The coordinates of P
b.) The gradient of AQ

c.) The angle of θ to one decimal place
d.) Find the area of ΔAQO
e.) G(a ; b) is a point of AQ. Show that b= 2a – 4
f.) Find the size of $Q\hat{A}T$

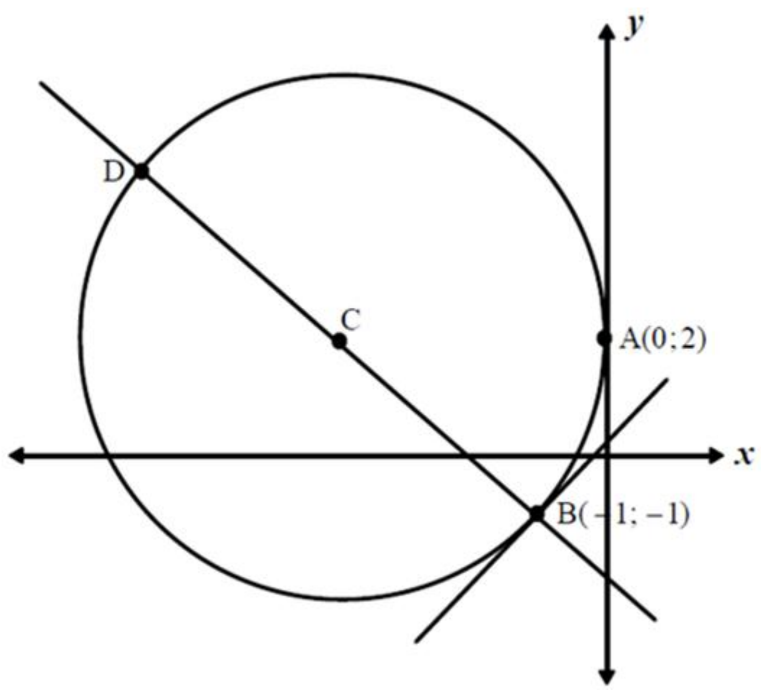
Question 3

Calculate the value of k if the points A(6;5), B(3;2) and C(2k ; k+4) are collinear.

Question 4

In the diagram below, a circle centre C touches the y-axis at A(0;2). A straight line with equation

3x + 4y = -7 cuts the circle at B(-1; -1) and D.



a.) Determine the equation of the tangent to the circle at B
b.) Determine the equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$
c.) Determine the coordinates of D

Question 5

Given a circle with the equation $2x^2 + 2y^2 - 12y + 4x = 30$

a.) Show that the coordinates of the circle centre are (-1;3)
b.) Find the length of the diameter
c.) Find the equation of the tangent to the circle at B(2;7)