1 Find the coordinates of the points of intersection of the circle $x^2 + y^2 = 25$ and the line $y = 3x$. Give your answers in surd form. [5]

2 $A(9, 8)$, $B(5, 0)$ an $C(3, 1)$ are three points.

 (i) Show that AB and BC are perpendicular. [3]

 (ii) Find the equation of the circle with AC as diameter. You need not simplify your answer.

 Show that B lies on this circle. [6]

 (iii) BD is a diameter of the circle. Find the coordinates of D. [3]

3 A circle has equation $x^2 + y^2 = 45$.

 (i) State the centre and radius of this circle. [2]

 (ii) The circle intersects the line with equation $x + y = 3$ at two points, A and B. Find algebraically the coordinates of A and B.

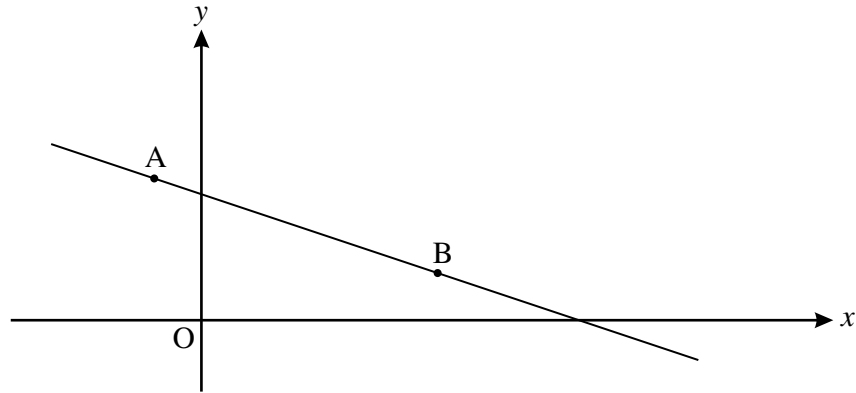 Show that the distance AB is $\sqrt{162}$. [8]

4

Fig. 11

Fig. 11 shows the line through the points A $(-1, 3)$ and B $(5, 1)$.

  (i) Find the equation of the line through A and B.   **[3]**

 (ii) Show that the area of the triangle bounded by the axes and the line through A and B is $\frac{32}{3}$ square units.   **[2]**

(iii) Show that the equation of the perpendicular bisector of AB is $y = 3x - 4$.   **[3]**

 (iv) A circle passing through A and B has its centre on the line $x = 3$. Find the centre of the circle and hence find the radius and equation of the circle.   **[4]**

5   **(i)** Points A and B have coordinates $(-2, 1)$ and $(3, 4)$ respectively. Find the equation of the perpendicular bisector of AB and show that it may be written as $5x + 3y = 10$.   **[6]**

     (ii) Points C and D have coordinates $(-5, 4)$ and $(3, 6)$ respectively. The line through C and D has equation $4y = x + 21$. The point E is the intersection of CD and the perpendicular bisector of AB. Find the coordinates of point E.   **[3]**

   (iii) Find the equation of the circle with centre E which passes through A and B. Show also that CD is a diameter of this circle.   **[5]**

6 The points A $(-1, 6)$, B $(1, 0)$ and C $(13, 4)$ are joined by straight lines.

   (i) Prove that the lines AB and BC are perpendicular. **[3]**

  (ii) Find the area of triangle ABC. **[3]**

 (iii) A circle passes through the points A, B and C. Justify the statement that AC is a diameter of this circle. Find the equation of this circle. **[6]**

 (iv) Find the coordinates of the point on this circle that is furthest from B. **[1]**