\[(x - 1)^2 + (y - 2)^2 + (x - 2)^2 + (y + 3)^2 = 2[(x + 2)^2 + (y - 3)^2]\]
\[\Rightarrow 2x^2 + 2y^2 - 6x + 2y + 18 = 2x^2 + 2y^2 + 8x - 12y + 26\]
\[\Rightarrow 14x - 14y + 8 = 0\]
\[\Rightarrow 7x - 7y + 4 = 0\]
Therefore, equation of locus is \(7x - 7y + 4 = 0\)

11. A straight rod of length 9 slides with its ends A, B always on the X and Y-axes respectively. Then find the locus of the centroid of \(\triangle OAB\).

**Sol.** The given rod AB meets X-axis at A and Y-axis at B.

Let \(OA = a\) and \(OB = b\) and \(AB = 9\).

Coordinates of A are \((a, 0)\) and B are \((0, b)\).

Let \(G(x, y)\) be the centroid of \(\triangle OAB\)

But Coordinates of G of \(\triangle OAB\) are \(\left(\frac{a}{3}, \frac{b}{3}\right)\)

Therefore, \(\left(\frac{a}{3}, \frac{b}{3}\right) = (x, y)\)

\[\Rightarrow \frac{a}{3} = x, \frac{b}{3} = y \Rightarrow a = 3x, b = 3y\]

But \(OA^2 + OB^2 = AB^2\) and given \(AB = 9\)

\[\Rightarrow a^2 + b^2 = 81\]
\[\Rightarrow 9(x^2 + y^2) = 81\]
\[\therefore \text{Equation of the locus of P is } x^2 + y^2 = 9\]

Problems for practice

1. Find the equation of the locus of a point which is at a distance 5 from \((-2, 3)\) in a plane.

   Ans. \(x^2 + y^2 + 4x - 6y - 12 = 0\).

2. Find the equation of locus of a point P, if the distance of P from A(3, 0) is twice the distance of P from B(\(-3, 0)\).

   Ans. \(x^2 + y^2 + 10x + 9 = 0\).

3. Find the locus of the third vertex of a right angled triangle, the ends of whose hypotenuse are \((4, 0)\) and \((0, 4)\).

   Ans. \(x^2 + y^2 - 4x - 4y = 0\)

4. Find the equation of locus of P, if the ratio of the distances from P to \((5, -4)\) and \((7, 6)\) is 2 : 3.

   Ans. \(5(x^2 + y^2) - 34x + 120y + 29 = 0\).

5. \(A(2, 3)\) and \(B(-3, 4)\) are two given points. Find the equation of locus of P so that the area of the triangle PAB is 8.5.

   Ans. \(x^2 + 10xy + 25y^2 - 34x - 170y = 0\)