# Tutorial sheet – CONIC SECTIONS

## Tutorial 1:

1. Find the equation of the circle with
   i.) centre $(\frac{1}{2}, \frac{1}{4})$ and radius $\frac{1}{12}$ .
   ii.) centre $(-a, -b)$ and radius $\sqrt{a^2 - b^2}$.

   Ans: $(x - 1/2)^2 + (y - 1/4)^2 = 1/144$
   Ans: $(x + a)^2 + (y + b)^2 = a^2 - b^2$
2. Find the centre and radius of the circles.

i) $x^2 + y^2 - 4x - 8y - 45 = 0$
   Ans: centre=(2,4), radius=$\sqrt{65}$

ii) $45x^2 + 45y^2 - 60x + 36y - 19 = 0$
   Ans: centre=$(\frac{2}{3}, \frac{-2}{5})$, radius=$\frac{\sqrt{41}}{15}$

3. Find the equation of the circle passing through the points (2,3) and (–1,1) and whose centre is on the line $x - 3y - 11 = 0$.
   Ans: $x^2 + y^2 - 7x + 5y - 14 = 0$

4. Find the equation of the circle with end points of diameter (2,-3) & (-3,5)
   Ans: $x^2 + y^2 + x - 2y - 21 = 0$

5. Find the equation of a circle with centre (2,2) and passes through the point (4,5).

   Ans: $x^2 + y^2 - 4x - 4y - 5 = 0$

6. Find the equation of the circle passes through the point (1,0), (–1,0) and (0,1)
   Ans: $x^2 + y^2 = 1$.

**Tutorial 2:**

I. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum.

**1.** $y^2 = 10x$ **2.** $x^2 = -9y$

*Ans:*

| | *focus* | *axis* | *directrix* | *Length of latus rectum* |
|---|---|---|---|---|
| *1* | *(5/2,0)* | *X axis* | *x=-5/2* | *10* |
| *2* | *(0,-9/4)* | *Y axis* | *y=9/4* | *9* |

II. Find the equation of the parabola that satisfies the following given conditions:

i) Vertex (0,0); focus (3,0)
Ans:$y^2=12x$

ii) Vertex (0,0); focus (–2,0)
Ans:$y^2=-8x$

iii) Vertex (0,0) passing through (2,3) and axis is along *x*-axis.
Ans:$2y^2=9x$

III. Find the coordinates of foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latus rectum of the ellipse

1 $\frac{x^2}{49}+\frac{y^2}{36}=1$

2. $36x^2 + 4y^2 = 144$

*Ans:*

| | *focus* | *vertices* | *Length of major axis* | *Length of minor axis* | *eccentricity* | *Length of latus rectum* |
|---|---|---|---|---|---|---|
| 1 | $(\pm\sqrt{13}, 0)$ | $(\pm7, 0)$ | 14 | 12 | $\frac{\sqrt{13}}{7}$ | 72/7 |
| 2 | $(0, \pm4\sqrt{2})$ | $(0, \pm6)$ | 12 | 4 | $\frac{2\sqrt{2}}{3}$ | 4/3 |

IV. Find the equation of the ellipse that have vertices (0,±13), foci (0,±5)

*Ans*: $\frac{x^2}{144}+\frac{y^2}{169}=1$

V. Find the coordinates of the foci and the vertices, the eccentricity and the length of the latus rectum of the hyperbola

$49y^2 - 16x^2 = 784.$

| *focus* | *vertices* | *eccentricity* | *Length of latus rectum* |
|---|---|---|---|
| $(0, \pm\sqrt{65})$ | $(0, \pm4)$ | $\frac{65}{4}$ | 49/2 |

VI. Find the equation of the hyperbola that have vertices (0, ±3), foci (0, ±5)

*Ans*: $\frac{y^2}{9}-\frac{x^2}{16}=1$