Locus

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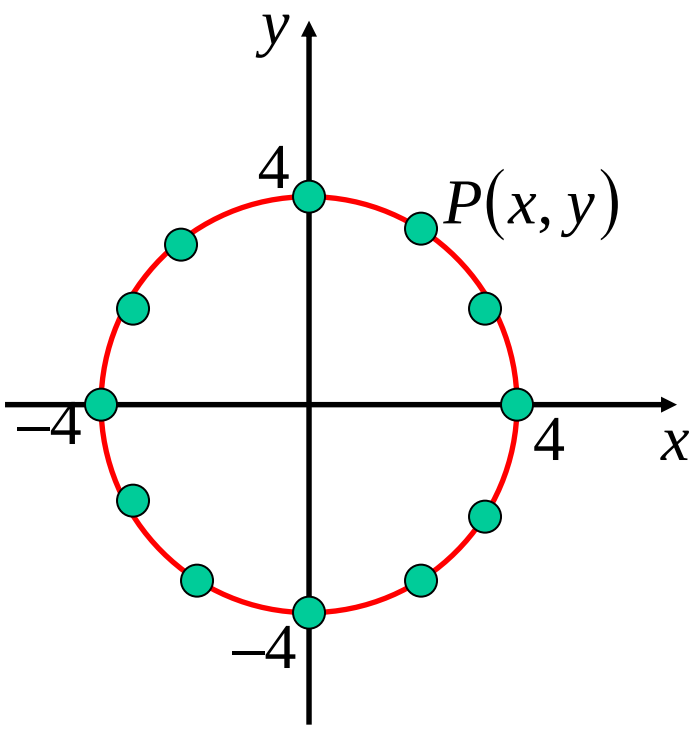
The collection of all points whose location is determined by some stated law.

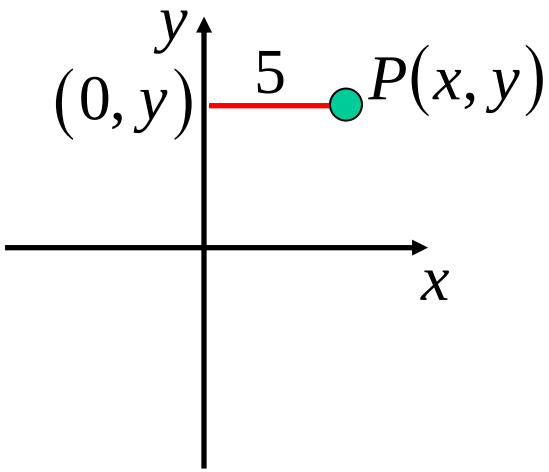
e.g. (i) Find the locus of the point which is always 4 units from the origin



$$\sqrt{(x-0)^2+(y-0)^2}=4$$

$$x^2+y^2=16$$

(ii) A point moves so that it is always 5 units away from the y axis

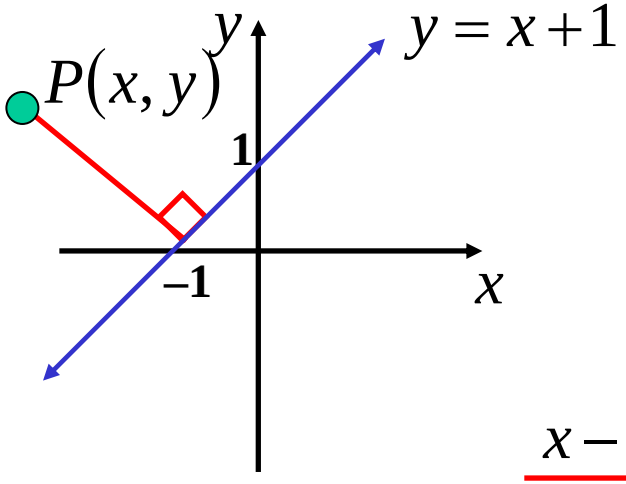


$$\sqrt{(x-0)^2+(y-y)^2}=5$$

$$x^2=25$$

$$x=\pm 5$$

(iii) A point moves so that it is always 3 units away from the line $y = x + 1$



$$\frac{|x-y+1|}{\sqrt{1^2+(-1)^2}}=3$$

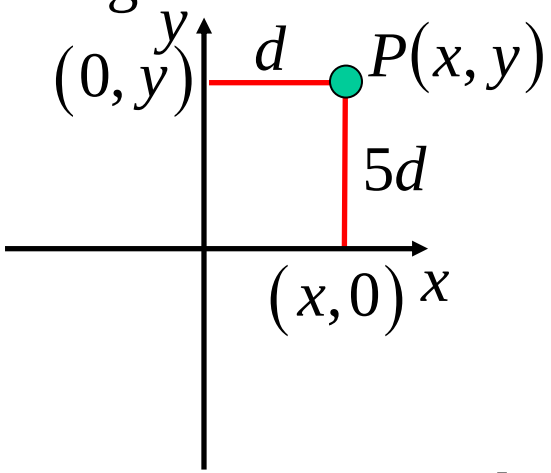
$$|x-y+1|=3\sqrt{2}$$

$$x-y+1=3\sqrt{2} \quad \text{or} \quad -(x-y+1)=3\sqrt{2}$$

$$x-y+1-3\sqrt{2}=0 \qquad -x+y-1=3\sqrt{2}$$

$$x-y+1+3\sqrt{2}=0$$

(iv) A point moves so that its distance from the x axis is always 5 times as great as its distance from the y axis.

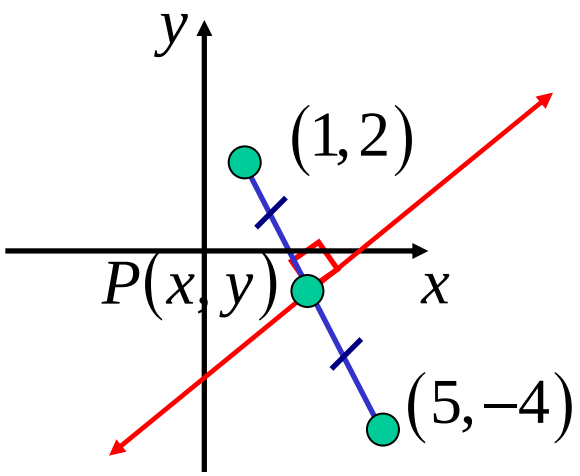


$$\sqrt{(x-x)^2+(y-0)^2} = 5\sqrt{(x-0)^2+(y-y)^2}$$

$$y^2 = 25x^2$$

$$y = \pm 5x$$

(v) A point moves so that its distance from (1,2) is the same as its distance from (5,–4).



Perpendicular bisector of (1,2) and (5,–4)

$$m_{AB} = \frac{-4-2}{5-1} \qquad M_{AB} = \left(\frac{1+5}{2}, \frac{-4+2}{2}\right)$$

$$= \frac{-6}{4} \qquad = (3,-1)$$

$$= \frac{-3}{2}$$

$$\therefore \text{ required slope} = \frac{2}{3}$$

$$y+1=\frac{2}{3}(x-3)$$

$$3y+3=2x-6$$

$$2x-3y-9=0$$

OR

$$\sqrt{(x-1)^2+(y-2)^2}=\sqrt{(x-5)^2+(y+4)^2}$$

$$x^2-2x+1+y^2-4y+4=x^2-10x+25+y^2+8y+16$$

$$8x-12y-36=0$$

$$2x-3y-9=0$$

Exercise 9A; 1aceg, 3a, 4, 6, 8, 10, 11, 13, 14