CHAPTER-7
COORDINATE GEOMETRY

Excercise 7.2

Q3. Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are $(0,-1),(2,1)$ and $(0,3)$. Find the ratio of this area to the area of the given triangle

Solution:

The coordinates are given as

$$\mathbf{A} = \begin{pmatrix} x \\ y \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \tag{1}$$

For collinear, ar(ABC) should be equal to zero

$$ar(ABC) = \frac{1}{2}\|(\mathbf{A}-\mathbf{B}) \times (\mathbf{A}-\mathbf{C})\| = 0 \tag{2}$$

$$\mathbf{A}-\mathbf{B} = \begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} x-1 \\ y-2 \end{pmatrix} \tag{3}$$

$$\mathbf{A}-\mathbf{C} = \begin{pmatrix} x \\ y \end{pmatrix} - \begin{pmatrix} 7 \\ 0 \end{pmatrix} = \begin{pmatrix} x-7 \\ y \end{pmatrix} \tag{4}$$

$$= \frac{1}{2}\begin{vmatrix} x-1 & x-7 \\ y-2 & y \end{vmatrix} = 0 \tag{5}$$

$$= x + 3y - 7 = 0 \tag{6}$$

Suppose, if x=-2,y=3 , then area of triangle ABC is equal to zero which is collinear as shown in Figure:1

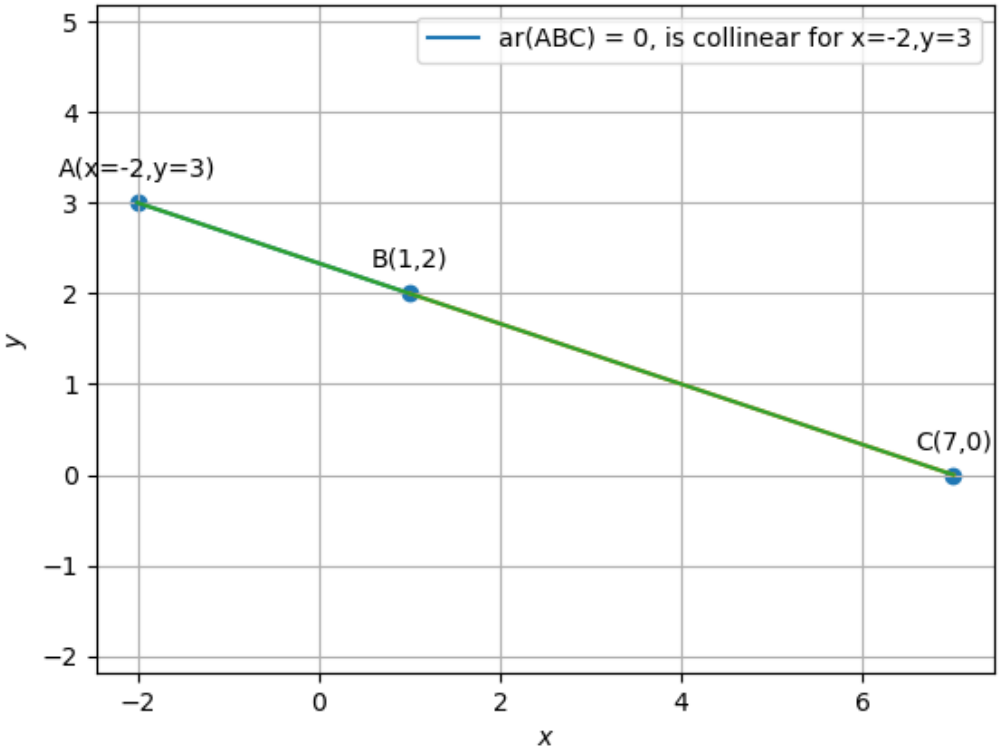
ar(ABC) = 0, is collinear for x=-2,y=3
A(x=-2,y=3)
B(1,2)
C(7,0)
5
4
3
2
1
0
−1
−2
−2
0
2
4
6
y
x

Figure 1: