Coordinate Geometry

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Class 10^{th} Maths - Chapter 7

This is Problem-5 from Exercise 7.3

QUESTION: Median of a triangle divides it into two equal triangles of same areas.Verify this result for triangle ABC whose vertices are A(4,-6) B(3,-2) C(5,2)

Solution:

Let AD be the median of triangle ABC

Then,

$$(1)$$

$$Coordinates of point D = Midpoint of BC \tag{2}$$

$$= \left(\frac{x1+x2}{2}, \frac{y1+y2}{2}\right) = \left(\frac{3+5}{2}, \frac{-2+2}{2}\right) = (4,0) \tag{3}$$

$$(4)$$

$$Area of triangle ABD = \frac{1}{2}\left|\left(AB \times BD\right)\right| \tag{5}$$

$$= \frac{1}{2}\begin{vmatrix} 1 & -1 \\ -4 & -2 \end{vmatrix} \tag{6}$$

$$= \frac{1}{2}\left((-2)-(4)\right) \tag{7}$$

$$= \frac{1}{2}(-6) \tag{8}$$

$$= -3 square units \tag{9}$$

However the area cannot be negative . Therefore the area of triangle ABD is equal to 3 square units

$$(10)$$

$$Areaoftriangle ACD = \frac{1}{2}\left|\left(AC \times CD\right)\right| \tag{11}$$

$$= \frac{1}{2}\begin{vmatrix} -1 & 1 \\ -8 & 2 \end{vmatrix} \tag{12}$$

$$= \frac{1}{2}\left((-2) - (-8)\right) \tag{13}$$

$$= \frac{1}{2}(6) \tag{14}$$

$$= 3 square units \tag{15}$$

The area of both sides is the same. Thus, median AD has divided ABC into two triangles of equal areas.