ASSIGNMENT

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1 PROBLEM 1

1.If $\mathbf{E}, \mathbf{F}, \mathbf{G}, \mathbf{H}$ are respectively the mid-points of the sides of a EFGH Parallelogram ABCD, show that area of Area of Parallelogram EFGH = $\frac{1}{2}$ Area of Parallelogram ABCD.

SOLUTION: Let,

$$\mathbf{A} = \begin{pmatrix}0\\4\end{pmatrix}, \mathbf{B} = \begin{pmatrix}2\\4\end{pmatrix}, \mathbf{C} = \begin{pmatrix}2\\0\end{pmatrix}, \mathbf{D} = \begin{pmatrix}0\\0\end{pmatrix} \tag{1.0.1}$$

$\therefore$ mid-points will be,

$$\mathbf{E} = \frac{A+B}{2} \tag{1.0.2}$$

$$= \frac{\begin{pmatrix}0\\4\end{pmatrix} + \begin{pmatrix}2\\4\end{pmatrix}}{2} \tag{1.0.3}$$

$$= \begin{pmatrix}1\\4\end{pmatrix} \tag{1.0.4}$$

$$\mathbf{F} = \frac{B+C}{2} \tag{1.0.5}$$

$$= \frac{\begin{pmatrix}2\\4\end{pmatrix} + \begin{pmatrix}2\\0\end{pmatrix}}{2} \tag{1.0.6}$$

$$= \begin{pmatrix}2\\2\end{pmatrix} \tag{1.0.7}$$

$$\mathbf{G} = \frac{D+C}{2} \tag{1.0.8}$$

$$= \frac{\begin{pmatrix}0\\0\end{pmatrix} + \begin{pmatrix}2\\0\end{pmatrix}}{2} \tag{1.0.9}$$

$$= \begin{pmatrix}1\\0\end{pmatrix} \tag{1.0.10}$$

$$\mathbf{H} = \frac{D+A}{2} \tag{1.0.11}$$

$$= \frac{\begin{pmatrix}0\\0\end{pmatrix} + \begin{pmatrix}0\\4\end{pmatrix}}{2} \tag{1.0.12}$$

$$= \begin{pmatrix}0\\2\end{pmatrix} \tag{1.0.13}$$

$$\text{Area of Parallelogram ABCD} = DA \times DC \tag{1.0.14}$$

$$= \begin{pmatrix}0\\-4\end{pmatrix} \times \begin{pmatrix}-2\\0\end{pmatrix} \tag{1.0.15}$$

$$= 0 - 8 \tag{1.0.16}$$

$$= -8 \tag{1.0.17}$$

$$\text{Area of Parallelogram EFGH} = GH \times GF \tag{1.0.18}$$

$$= \begin{pmatrix}1\\-2\end{pmatrix} \times \begin{pmatrix}-1\\-2\end{pmatrix} \tag{1.0.19}$$

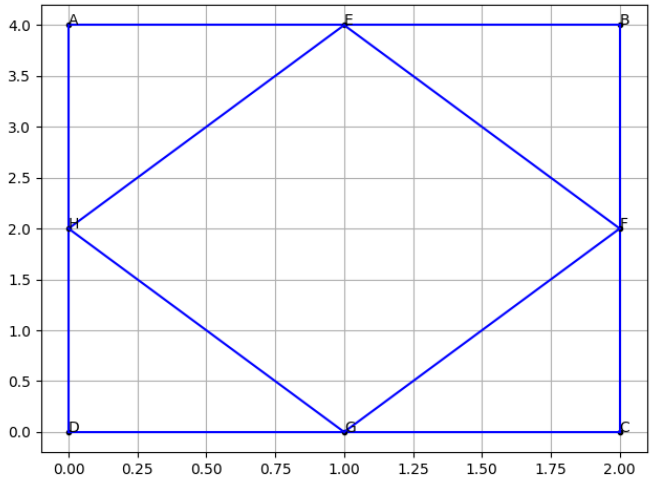

Fig. 0: Paralleogram according to the given vectors