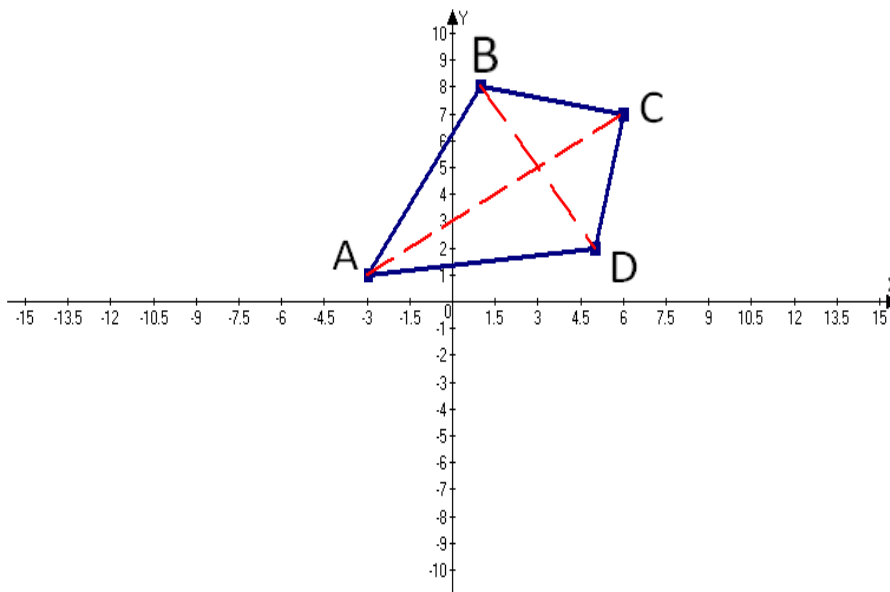


Answer on Question #55350 – Math – Analytic Geometry

A quadrilateral has vertices A(-3, 1), B(1, 8), C(6, 7), and D(5, 2). What kind of quadrilateral is it? Explain using the vectors.

Solution

Draw a rectangle ABCD in the Cartesian coordinate system



Consider the sides of the quadrilateral as vectors.

We find coordinates and moduli of vectors \overrightarrow{AB} , \overrightarrow{BC} , \overrightarrow{CD} , \overrightarrow{DA} .

Coordinates

$$\overrightarrow{AB} = (x_B - x_A; y_B - y_A) = (1 - (-3); 8 - 1) = (1 + 3; 8 - 1) = (4; 7);$$

modulus

$$|\overrightarrow{AB}| = \sqrt{x_{AB}^2 + y_{AB}^2} = \sqrt{4^2 + 7^2} = \sqrt{65}.$$

Coordinates

$$\overrightarrow{BC} = (x_C - x_B; y_C - y_B) = (6 - 1; 7 - 8) = (5; -1);$$

modulus

$$|\overrightarrow{BC}| = \sqrt{x_{BC}^2 + y_{BC}^2} = \sqrt{5^2 + (-1)^2} = \sqrt{26}.$$

Coordinates

$$\overrightarrow{CD} = (x_D - x_C; y_D - y_C) = (5 - 6; 2 - 7) = (-1; -5);$$

modulus

$$|\overrightarrow{CD}| = \sqrt{x_{CD}^2 + y_{CD}^2} = \sqrt{(-1)^2 + (-5)^2} = \sqrt{26}.$$

Coordinates

$$\overrightarrow{DA} = (x_A - x_D; y_A - y_D) = (-3 - 5; 1 - 2) = (-8; -1);$$

modulus

$$|\overrightarrow{DA}| = \sqrt{x_{DA}^2 + y_{DA}^2} = \sqrt{(-8)^2 + (-1)^2} = \sqrt{65}.$$

As the vectors are not collinear, then the sides are not parallel. Notice that the sides of a quadrilateral are pairwise identical: $AB=AD$ and $CB=CD$.

According to the definition, this quadrilateral is a deltoid, also known as a kite.

A kite is a quadrilateral whose four sides can be grouped into two pairs of equal-length sides that are adjacent to each other.

Answer: this quadrilateral is a deltoid.