Problem 6: Defining Property of Rectangles

Let A, B, C, D be 4 points in space such that no three of them are collinear. Show that if

$$\text{for all points } X \text{ in space, } |AX|^2 + |CX|^2 = |BX|^2 + |DX|^2$$

then A, B, CD is a rectangle.

As always, show your work, fully explain and justify your answer. A solution mainly obtained by computers or calculators will not be accepted.

Posting Date 11/5/2021. Submit solutions to Noah Aydin, Mathematics Department, RBH 319 by e-mail or hard-copy by 4 pm on Friday, Nov 19, 2021. An email submission must be a single pdf file. Hard copy submissions must be dropped in the file holder at my office door (Hayes 319) and must include a time stamp.