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On Euler's quadrilateral theorem in the Taxicab plane

The well-known Euler's quadrilateral theorem states that in any quadrilateral $ABCD$, if its diagonals AC and BD are bisected by points M and N, which are joined by segment MN, then the sum of the squares of the four sides, $AB^2 + BC^2 + CD^2 + DA^2$ is equal to the sum of the squares of the two diagonals, $AC^2 + BD^2$ plus four times the square of the line MN. That is to say [13]

$$AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2 + 4MN^2 \tag{1}$$

Here, in this study, we give taxicab version of Euler's quadrilateral theorem.

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