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POS-49 - Fourth order superintegrable systems separating in Polar Coordinates

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We present all real quantum mechanical potentials in a two-dimensional Euclidean space that have the following properties: 1. They allow separation of variables in polar coordinates, 2. They allow an independent fourth order integral of motion, 3. Their angular component $S(\theta)$ does not satisfy any linear ODE. We show that $S(\theta)$ satisfies a nonlinear ODE that has the Painlevé property. The classical analog, including the generating algebra of the integrals of motion, is considered as well.

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