

TITLE: On the force fields that are homogeneous of degree -3

ABSTRACT: Soon after discovering the properties of  $1/r^2$  law of force, Newton noticed that a force in  $1/r^3$  also has striking properties. Newton studied the effect of adding such a force to another force (Proposition 44). Much later, Jacobi gave famous results on forces which are (positively) homogeneous of degree -3 and derived from a potential. More recently, Richard Montgomery gave an impressive description of the dynamics of the zero angular momentum planar 3-body problem with  $1/r^3$  law of force.

Such homogeneity of the fields of forces appears while studying Appell's projective dynamics. But projective dynamics only studies these fields after defining a constraint. We deduce a very elementary property: the dynamics defined by a force field which is homogeneous of degree -3 can always be reduced, by simply constraining it. We will show how the classical results are related with this remark, and show examples where new properties appear.

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