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Some Interesting Behavior in a Non-Inertial Oscillator RICHARD HYDE, Norwich University — A well-known result from classical mechanics indicates that as the velocity-dependent damping applied to an unforced oscillator increases, the transient behavior passes from under-damped oscillations to over-damped decay. The differential equation describing this phenomenon is studied by all undergraduate physics, mathematics and electrical engineering majors. A surprising outcome occurs when the oscillator is placed in a purely rotating reference frame and allowed to execute two-dimensional motion. There, the fictitious centrifugal and Coriolis forces lead to a counter-intuitive result as the damping is increased: first (as in the non-rotating case), the motion passes from under-damped to over-damped but then (unlike the non-rotating case) under-damped oscillations reappear at higher values of damping. An analysis of the time-dependence of the differential equation system describing the non-inertial oscillator will show that the eigenvalues of system lapse from complex (under-damped) to real (over-damped) to complex (under-damped) as the damping parameter increases.

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