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Time evolution in higher-derivative theories of gravity

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I will clarify that higher-derivative theories and associated opposite-sign kinetic terms are no obstruction for long-lived classical motion. For point-particle models, integrability allows for proof of global stability. For scalar field theories, mathematical theorems establish well-posed time evolution for sufficiently small, compactly-supported initial data and numerical scattering solutions suggest that said small-data global stability extends also to large data. These toy-models moreover demonstrate that (i) higher frequency modes are more stable not less stable, and (ii) heavy ghosts can be integrated out. Finally, I connect these insights to recent progress in numerical relativity, enabling well-posed time evolution in higher-derivative effective field theories of gravity.

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