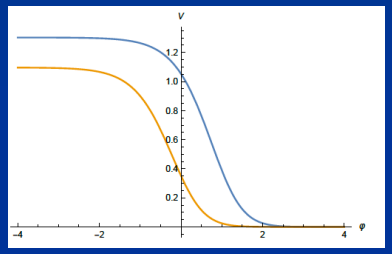
Tasks for quantum gravity

Understanding of key functions beyond Einstein gravity

- Graviton propagator
- Effective scalar potential
- Encoded in diffeomorphism invariant effective action for (single) metric and scalars, from which quantum field equations and fluctuation spectrum can be extracted
- Consequences for black holes and cosmology

Effective scalar potential

Inflaton potential and cosmon potential for dynamical dark energy or quintessence



Higgs potential for prediction of top quark mass and Higgs inflation

Derivative expansion: three functions with error estimates

$$\Gamma = \int_\chi \sqrt{g}\Big\{ -\frac{1}{2}F(\chi)R + \frac{1}{2}K(\chi)\partial^\mu\chi\partial_\mu\chi + U(\chi)\Big\}$$