oscode: fast solutions of oscillatory ODEs in cosmology

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What?

- C++ package with C++ and Python interface
- Solves $\ddot{x}(t) + 2\gamma(t)\dot{x}(t) + \omega^2(t)x(t) = 0$
- ω and γ can be explicit functions of time or array-like containers, storing results of numerical calculations

Why?

- Generalised oscillators extremely common in physics:
- Schrödinger equation, propagation of waves in atmosphere, primordial perturbations, . . .
- Available numerical solvers inefficient at high frequencies, even if frequency varies slowly

How?

- Problem is poor representation of solution
- Use the Wentzel–Kramers–Brillouin approximation
- This allows **skipping over** highly oscillatory regions