Exercise 2:

Let us consider a universe containing matter and dark energy with a constant equation-of-state parameter w, where the present values of their density parameters are $\Omega_m^0 = 0.3$ and $\Omega_d^0 = 0.7$, respectively.

2.1. Compute the redshift at which the expansion of the universe starts to accelerate.

2.2. Compute the redshift at which the dynamics of the universe starts to be dominated by dark energy.

2.3. Determine how the difference between these redshifts changes when w varies near ?1.

Solution:

The difference between the redshifts given by Eqs. (7) and (**??**) can be conveniently considered from

Exercise 4:

4.1. Ultra-slow-roll inflation is a class of inflation satisfying the condition $dV/d\phi = 0$.

(a) Find the solutions to the equation of motion for the inflaton field.

(b) Compute the slow-roll parameters ϵ and η.

Solution:

(c) Does this inflationary model admit a graceful exit?

Solution:

4.2. Constant-roll inflation is defined by $\ddot{\phi} = bH\dot{\phi}$

(a) Find the solutions to the equation of motion for the inflaton field.

Solution:

(b) Compute the slow-roll parameters ϵ and η.

Solution:

(c) Does this inflationary model admit a graceful exit?

Solution: