

PY3726 Assignment 4**Due: tbd**

1. Find the general solutions for a homogeneous spatially flat cosmology for gravity coupled to a free massless scalar field.

2. Use $V = \lambda\phi^4$ and assume that slow roll starts from $\phi = \phi_i \neq 0$ and progresses towards the origin. Show that the slow roll solutions are

$$\phi = \phi_i \exp\left(-\sqrt{\frac{32\lambda}{3\pi G}}(t - t_i)\right)$$

and

$$a = a_i \exp\left(\pi G \phi_i^2 \left[1 - e^{-\sqrt{\frac{8\lambda}{3\pi G}}(t-t_i)}\right]\right),$$

where a is the scale factor.