II.6. Consider a massless scalar field ϕ with $V(\phi)=0$. Suppose this field is rolling, $\dot{\phi}\neq 0$, and that it dominates the energy density of the Universe. From $T^{(\phi)}_{\mu\nu}$, find the equation of state for ϕ. What does it imply for the redshifting of ρ_ϕ?

II.7. Slow roll inflation:

a) Express the slow roll conditions $\varepsilon \equiv -\frac{\dot{H}}{H^2} \ll 1$ & $\eta \equiv \frac{\dot{\varepsilon}}{H\varepsilon} \ll 1$ which guarantee an inflationary expansion & long enough lasting period of inflation, respectively, solely in terms of (derivatives of) $V(\phi)$

b) Consider an inflationary potential $V(\phi)=\lambda\phi^4$. Assume field rolls from some value ϕ_i towards 0. At what values of ϕ does $\varepsilon \ll 1$, $\eta \ll 1$ break down?
Assuming that inflation ends when $\varepsilon = 1$, calculate the number of e-foldings of inflation, given a starting value of ϕ_i: