

Homework # 2

Out Fri, Oct 10. Due Fri, Oct 17

1. (5 points) For the inflationary model with the massive scalar field ($V(\phi) = m^2\phi^2/2$), check that the slow-roll approximation ($|\dot{\phi}| \ll m\phi$, $|\ddot{\phi}| \ll m^2\phi$) actually applies during inflation. Find the limit when the approximation breaks down.
2. (10 points) Compute the perturbation spectrum for $a_f = 10^{-22}$ at several values of k between 10^4 Mpc and 10 kpc, and fit them with a power-law form. What is the value of the slope?
3. (10 points) Repeat the previous exercise for $a_f = 10^{-24}$ and $a_f = 10^{-26}$ and check the sensitivity of the power-law slope on the assumed expansion factor since the end of inflation.