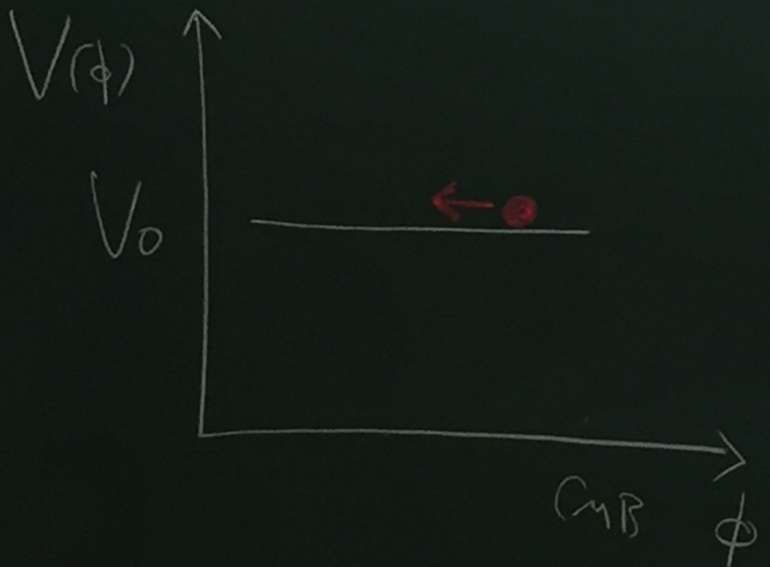
Consistent ΔN formalism in Stochastic Ultra-slow Roll. (with T. Prokopec, in progress)

- Great Recent interest in P.B.Hs
- Possibility of production from a flat portion of $V(\phi)$



GR on long wavelengths - Leading Gradients

$$ds^2 = -A(\tau,\vec{x})\,d\tau^2 + e^{2\alpha(\tau,\vec{x})}\,d\vec{x}^2$$

$$H(\tau,\vec{x}) = \frac{1}{A}\frac{d\ln\alpha}{d\tau}$$

$$H^2 = \frac{1}{3}\left(\frac{1}{2}\Pi^2 + V(\phi)\right), \quad \boxed{\partial_i H = -\frac{1}{2}\Pi\,\partial_i\phi}$$

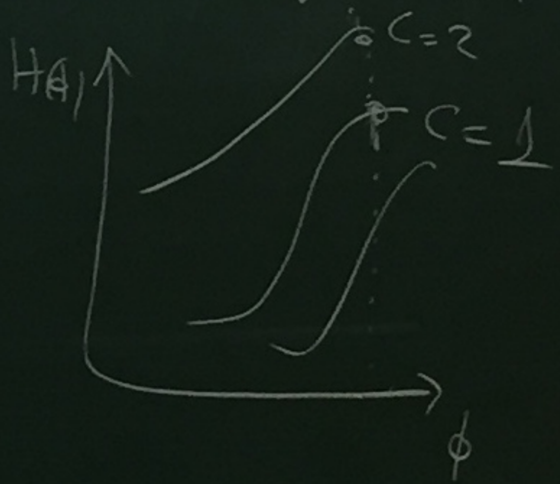
$$\frac{d\phi}{A\,d\tau} = \Pi, \quad \frac{1}{A}\frac{d\Pi}{d\tau} = -3H\Pi - V'$$

$$H(\phi, c) \Rightarrow \boxed{\Pi = -2\frac{\partial H}{\partial \phi}}$$

$$\hookrightarrow \Pi(\phi, c) \Rightarrow \boxed{\underline{\partial_i c = 0}}, \quad \underline{\partial_t c} = 0$$

$$\boxed{\left(\frac{dH}{d\phi}\right)^2 = \frac{3}{2}H^2 - \frac{1}{2}V(\phi)}$$

H J Equation



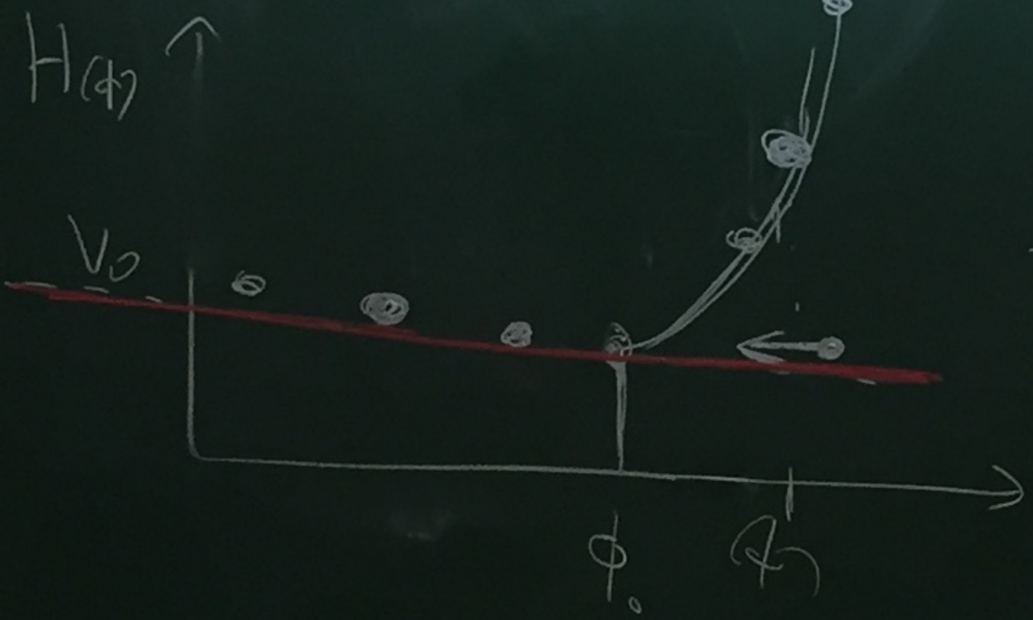
$$\boxed{\left(\frac{dH}{d\phi}\right)^2 = \frac{3}{2}H^2 - \frac{1}{2}V_0}$$

HJ

$$V(\phi) = V_0$$

$$H_0 = \frac{\sqrt{V_0}}{\sqrt{3}}$$

$$H(\phi) = H_0 \cosh\sqrt{\frac{3}{2}}\left(\phi - \phi_0\right), \Rightarrow \;\ldots$$



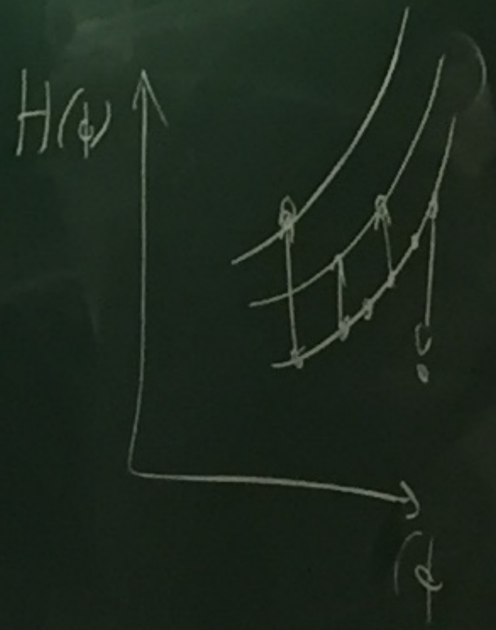
$$N = \infty$$

Two distinct Solutions.

...radients.

i) Moving, all points go to ϕ_0

ii) Static, $\phi_0(\vec{x})$



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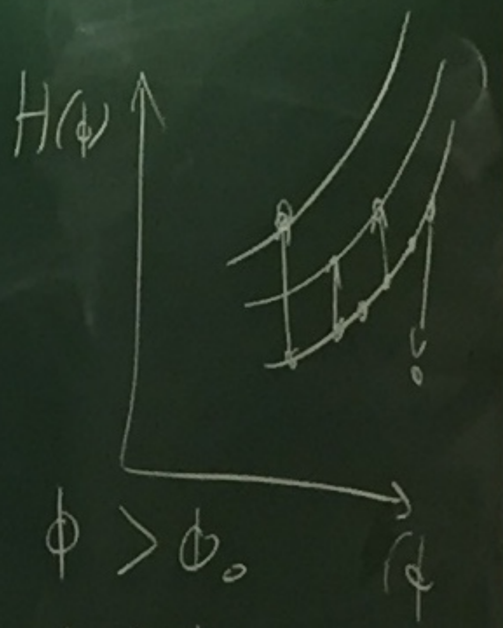


$$\frac{d\phi}{A\,d\tau} = -2\,\frac{dH(\phi_1,\phi_2)}{d\phi} + \xi$$

$\phi > \phi_0$

$\phi < \phi_0$

$$\frac{d\phi}{A\,d\tau} = \xi$$

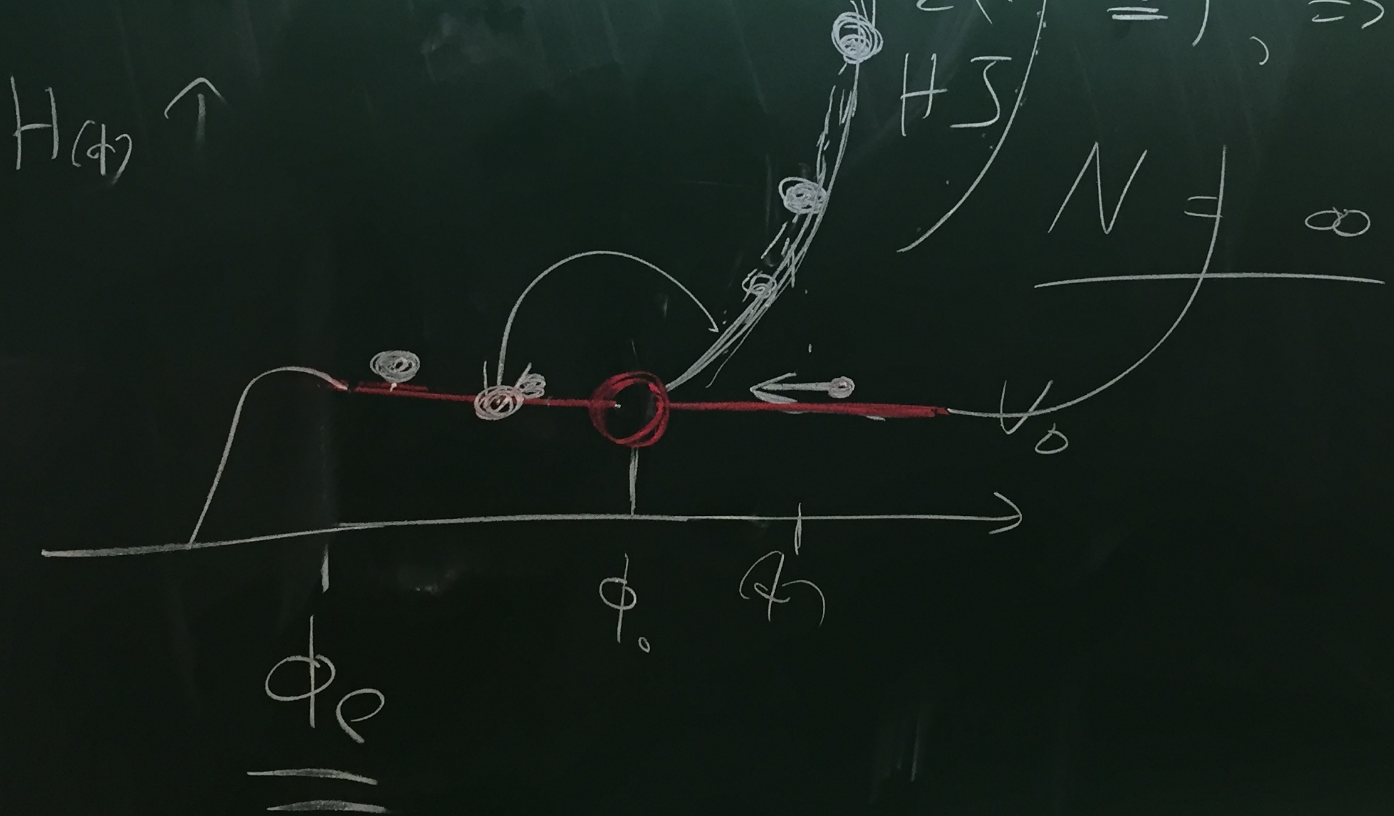
$$\boxed{\left(\frac{dH}{d\phi}\right)^2 = \frac{3}{2}H^2 - \frac{1}{2}V_0(\phi)}$$

HJ

$V(\phi) = V_0$,

$$H_0 = \frac{\sqrt{V_0}}{\sqrt{3}}$$

$$H(\phi) = H_0 \cosh\sqrt{\frac{3}{2}}(\phi - \phi_0) \,, \Rightarrow \ldots$$



Conveyor Belt of USR.

...radients.

$$\dot{\phi} = \frac{dH}{d\phi} + \xi_\phi$$

$$\dot{\pi} = -3H\pi - V' + \xi_\pi$$

$$\Delta\phi_0 = \frac{A\sigma_\pi}{18H^3}\frac{\partial H}{\partial\phi} A\Delta\tau + \left(\frac{1}{3H}\xi_\pi + \xi_\phi\right) A\Delta\tau$$

d

A

ϕ

ϕ_0