CONSIDER:

$$\frac{dH^2}{dt} = 2H\frac{dH}{dt}$$

WE ALSO HAVE:

$$\frac{dH^2}{dt} = \frac{d}{dt}\left(\frac{1}{3}\left(V(\phi) + \frac{1}{2}\dot\phi^2\right)\right)$$

$$= \frac{1}{3}\frac{dV}{d\phi}\frac{d\phi}{dt} + \dot\phi\ddot\phi$$

$$= \frac{1}{3}\dot\phi\left(\underbrace{V' + \ddot\phi}_{-3H\dot\phi}\right)$$

$$= -H\dot\phi^2 \qquad \llcorner -3H\dot\phi$$

$$\Rightarrow 2H\frac{dH}{dt} = -H\dot\phi^2 \Rightarrow \frac{dH}{dt} = -\frac{1}{2}\dot\phi^2$$

"HENCE DERIVE"

$$\frac{dH}{d\phi} = \frac{dH}{dt}\frac{dt}{d\phi} = \frac{\dot H}{\dot\phi}$$

SO WE HAVE:

$$H'^2 = \left(\frac{\dot H}{\dot\phi}\right)^2 = -\frac{1}{2}\dot H$$

SUBSTITUTE IN: (FOR H'^2 & H^2)

$$H'^2 - \frac{3}{2}H^2 = -\frac{1}{2}\dot H - \frac{3}{2}\frac{1}{3}\left(V + \frac{1}{2}\dot\phi^2\right)$$

$$= -\frac{1}{2}V - \frac{1}{2}\left(\underbrace{\dot H + \frac{1}{2}\dot\phi^2}_{0}\right)$$

$$= -\frac{1}{2}V$$

"SHOW THAT"

$$H'^2 - \frac{3}{2}H^2 = -\frac{1}{2}V \qquad \qquad /:H^2$$

$$\left(\frac{H'}{H}\right)^2 - \frac{3}{2} = -\frac{1}{2}\frac{V}{H^2}$$

$$\underbrace{\quad} \quad L = \frac{1}{2}\epsilon_H$$

$$\epsilon_H - 3 = -\frac{V}{H^2} \qquad \qquad /:-3 \cdot H^2$$

$$\underline{\underline{H^2\left(1 - \frac{1}{3}\epsilon_H\right) = \frac{1}{3}V}}$$