Why Bernoulli constant = 0 — S.A. Kinnas 9/29/2015

DEEP H_2O:

$$\rho \frac{\partial \phi}{\partial t} + p + \rho g \eta + \rho \frac{q^2}{2} = \text{Const.} \quad (1)$$

$$\phi = \frac{a\omega}{k} e^{kz} \sin(kx - \omega t)$$

$$\frac{\partial \phi}{\partial t} = \frac{a\omega}{k} e^{kz} \cos(kx-\omega t)(-\omega) = -\frac{a\omega^2}{k} e^{kz} \cos(kx-\omega t)$$

Apply (1) on the free surface:

$$-\rho \frac{a\omega^2}{k} e^{kz} \cos(kx-\omega t) + p + \rho g \eta + \rho \frac{q^2}{2} = \text{const.}$$

($e^{kz} = 1$ $(z \approx 0)$; $p = 0$ (due to dbc on free surface); $\rho \frac{q^2}{2}$ = H.O.T.)

$$\Rightarrow \quad -\frac{\omega^2}{k} a \cos(kx-\omega t) + g a \cos(kx-\omega t) = \frac{\text{Const.}}{\rho}$$

$$-\frac{\omega^2}{k} + g = \text{const.} / [a \cos(kx-\omega t) \rho]$$

↑ this should be independent of x, t

so **const = 0!**