weg?

$$\Rightarrow \mathcal{J} = m\dot{x}\cos(\omega t) + \omega m \sin(\omega t) x \quad (\checkmark)$$

b)

$$\frac{\partial \mathcal{J}}{\partial t} = m(\ddot{x}\cos(\omega t) + \omega\dot{x}\sin(\omega t) + \omega^2 x\cos(\omega t) + \omega\dot{x}\sin(\omega t))$$

$$= m(\cos(\omega t)\underbrace{(\ddot{x}+\omega^2 x)}_{=0 \text{ (harm. Oszilator)}} - \sin(\omega t)(\dot{x}\omega - \dot{x}\omega)$$

$$= 0 \quad \square \quad (\checkmark)$$

„durch bekannte Lösung des harm. Oszillators"

c) $x' = x + \alpha t$ $\qquad$ $\ddot{x} = -g$ nicht bekannt, ok.

$$L = T - V = \frac{m}{2}\dot{x}^2 - mgx \ , \ L' = \frac{m}{2}(\dot{x}^2 + 2\dot{x}\alpha + \alpha^2) - mg(x+\alpha t)$$

$$= \underbrace{\frac{m}{2}\dot{x}^2 - mgx}_{L} + \frac{m}{2}(2\dot{x}\alpha + \alpha^2) - mg\alpha t$$

$$\Rightarrow \frac{d}{dt}\mathcal{X} = m\dot{x}\alpha - mg\alpha t + f(\alpha^2) \quad \text{wird } 0$$

$$\Rightarrow \frac{\partial \mathcal{X}}{\partial \alpha}\bigg|_{\alpha=0} = m\int \dot{x} - gt \, dt = m(x - \tfrac{1}{2}gt^2)$$

$$\boxed{\frac{d\mathcal{J}}{dt} = m(\dot{x} + \ddot{x}t + gt - \dot{x}) = m(\ddot{x}t + gt) = mt\underbrace{(\ddot{x}+g)}_{=0} = 0 \ \square} \ \checkmark$$

$$\Rightarrow \mathcal{J} = m\dot{x}t - m(x - \tfrac{1}{2}gt^2) = m(-\tfrac{1}{2}gt^2 + \dot{x}t - x) \ \checkmark$$

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