Q1)
$$V(x) = -V_0 \exp \left[-\left(\frac{x}{\lambda}\right)^2 + \frac{2(\frac{x}{\lambda})}{2} \right]$$
Q1)
$$\frac{dV}{dx} = -V_0 \exp \left[-\left(\frac{x}{\lambda}\right)^2 + \frac{2(\frac{x}{\lambda})}{2} \right] \left(-\frac{2x}{\lambda^2} + \frac{2}{\lambda} \right) = 0$$

$$\frac{2x}{\lambda^2} = \frac{2}{\lambda^2}$$

$$\frac{2x}{4^2} = \frac{2}{4}$$

$$\frac{2}{4^2} = \frac{2}{4}$$

$$\frac{d^2V}{dx^2} = Vo \exp\left[-\left(\frac{x}{\lambda}\right)^2 + 2\left(\frac{x}{\lambda}\right)\right] \cdot \frac{2}{\lambda^2}$$

$$- Vo \exp\left[-\left(\frac{x}{\lambda}\right)^2 + 2\left(\frac{x}{\lambda}\right)\right] \left(\frac{-2x}{\lambda^2} + \frac{2x}{\lambda^2}\right)$$

$$- \text{Vo exp} \left[-\left(\frac{x}{\lambda}\right)^2 + 2\left(\frac{x}{\lambda}\right) \right] \left(-\frac{2x}{\lambda^2} + \frac{2x}{\lambda^2} \right)$$

$$= \text{Vo.exp(1)} \cdot \frac{2}{\lambda^2} > 0$$

$$= \frac{d^2V}{dx^2} \left| x = e^{-\frac{2x}{\lambda^2}} + \frac{2(\frac{x}{\lambda})}{\lambda^2} \right|$$

$$- \text{Vo exp} \left[-\left(\frac{x}{\lambda}\right)^2 + 2\left(\frac{x}{\lambda}\right) \right] \left(-\frac{2x}{\lambda^2} + \frac{2}{\lambda} \right)$$

$$= \text{Vo. exp(1)} \cdot \frac{2}{\lambda} > 0$$

$$- \frac{d^{2}V}{dx^{2}} = Vo \cdot \exp(1) \cdot \frac{2}{12} > 0$$

$$- \text{Vo exp} \left[-\left(\frac{x}{\lambda}\right)^{2} + 2\left(\frac{x}{\lambda}\right) \right] \left(-\frac{2x}{\lambda^{2}} + \frac{2}{\lambda^{2}} \right)$$

$$= \frac{d^{2}V}{dx^{2}} \left| x = e \right| = \frac{2}{\lambda^{2}} > 0$$

$$\frac{dV}{dx^2}\Big|_{X=2} = Vo \cdot exp(1) \cdot \frac{2}{12} > 0$$

$$= voe have a minimum at $x=1=x_0$$$

$$\frac{d^2V}{dx^2}\Big|_{x=\ell} = Vo \cdot exp(1) \cdot \frac{2}{12} > 0$$

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$$dx^{2} \mid x = e$$

$$\therefore we have a minimum at $x = l = x_{0}$

$$b) V(x_{0}) = -V_{0} \exp(i)$$$$

$$V(x_0) = -V_0 \exp(i)$$

$$V(x_0) = -V_0 \exp(i)$$

$$V'(x_0) = 0 \rightarrow \omega e \text{ wave a minimum at } x = x_0$$

$$V(x_0) = -V_0 \exp(t)$$

$$V'(x_0) = 0 \rightarrow \omega e \text{ nave a minimum at } x = x_0$$

$$V^{1}(x_{0}) = 0 \rightarrow \omega e$$
 have a minimum at $x = x_{0}$

$$V''(x_0) = 0 \rightarrow \omega e \text{ nave a minimum at } x = x_0$$

$$V''(x_0) = \frac{2V_0}{A^2} \exp(x)$$

$$: \Lambda(\kappa) = \sum_{i \in \mathcal{N}} \frac{ni}{(\kappa_0)} (\kappa - \kappa_0)_{i}$$

$$= \Lambda(xo) + \frac{1}{\Lambda_{\lambda}(xo)}(x-xo) +$$

$$= \Lambda(xo) + \overline{\Lambda_{i}(xo)}(x-xo) +$$

$$= \Lambda(xo) + \overline{\Lambda_{\lambda}(xo)}(x-xo) +$$

 $C) \quad \omega = \int \frac{v''(\kappa_0)}{m} = \int \frac{2w_0 \exp(u)}{m L^2}$

we know: 0 + mgl 0=0

: 0(t) = A cos(wt + p)

 $\omega_{S}(\phi) = 0$

It is given that $\theta(0) = 0$

I for a sood about its end = $\frac{1}{3}$ m 1^2

W = Ingd = Ing 1/2 = 39 I dispance /3 mit 22

 $\Rightarrow \theta = -\omega^2 \theta$; $\omega = \frac{mgd}{T}$

Q2)

b)

$$= V(x_0) + \frac{1i}{V_1(x_0)}(x - x_0) + \frac{5i}{V_{11}(x_0)}(x - x_0)^2$$

= $-V_0 \exp(1) + O(x - x_0) + 2v_0(x - x_0)^2 + \cdots$

$$= \Lambda(xo) + \overline{\Lambda}, (xo)(x-xo) +$$

$$= V(x_0) + V'(x_0)(x - x_0) +$$

$$V(\kappa) = \sum_{n} \frac{v_n(x_0)}{v_n(x_0)} (x - x_0)$$

$$\cdot \cdot \cdot \mathsf{A}(\kappa) = \sum_{i=1}^{N} \sqrt{\frac{n!}{(n!)!} (x^{-i})} (x^{-i} \times 0)^{N}$$

$$\dot{\Theta}(t) = -A \omega \sin(\omega t + \phi)$$
 $\dot{\Theta}(0) = -A \omega \sin(\phi) = -20$

$$\Rightarrow A = \frac{-20}{-20}$$

$$\omega$$
 sin(ϕ) ω kn ω , ω nen ω s(ϕ) = 0, $\sin(\phi)$ = ±1

we know, when
$$usc\phi = 0$$
, $sinc\phi$

in max A occurs when $sin(\phi) = -1$