

Oscillations - repetitions events

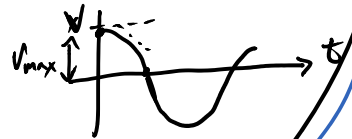
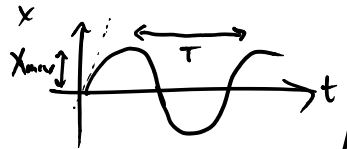
General \* restoring force + potential well

S.H.M. \* linear restoring force + quadratic Potential Well

form of  $F^R = -"k" x$  ,  $U = \frac{1}{2} "k" x^2$

Newton's 2nd Law  $-k x = m \frac{\Delta^2 x}{\Delta t^2}$  slope of  $x(t)$

Solutions  $x(t) = X_{max} \begin{matrix} \text{sin} \\ \text{or} \\ \text{cos} \end{matrix} (\omega t)$   
 I.C.  $\uparrow$   $\varphi$  measured or modeled



$v(t) = \underbrace{v_{max}}_{X_{max} \omega} \begin{matrix} \text{cos} \\ \text{or} \\ -\text{sin} \end{matrix} (\omega t)$

$a(t) = \underbrace{a_{max}}_{v_{max} \omega} \begin{matrix} -\text{sin} \\ \text{or} \\ \text{cos} \end{matrix} (\omega t)$

Specific Systems

mass & spring  
 $\omega = \sqrt{\frac{k}{m}}$

small  $\theta$  simple pendulum  
 $\omega = \sqrt{\frac{g}{l}}$

General Features

$\omega = \frac{2\pi}{T} = 2\pi f$  , Independent of Amplitude