

The phase angle for a block-spring system is  $\frac{\pi}{6}$  rad

$$\text{if } x(t) = x_m \cos(\omega t + \phi)$$

What is the ratio of  $E_k$  to  $U$  at  $t=0$ ?

$$U(t) = \frac{1}{2} k x_m^2 \cos^2(\omega t + \phi)$$

$$E_k(t) = \frac{1}{2} k x_m^2 \sin^2(\omega t + \phi)$$

$$\frac{E_k(t)}{U(t)} = \frac{\frac{1}{2} k x_m^2 \sin^2(\omega t + \phi)}{\frac{1}{2} k x_m^2 \cos^2(\omega t + \phi)} = \frac{\sin^2 \phi}{\cos^2 \phi}$$

$$= \tan^2 \phi$$

$$= \tan^2\left(\frac{\pi}{6}\right) = \boxed{0.333}$$