

Springs

1.) What are the 2 requirements for SHM?

-
-

2.) What are the formulae for x , v , a in SHM?

$$x = A \cos \omega t$$

Amplitude \downarrow angular velocity \downarrow position \downarrow

$$v = -A\omega \sin \omega t$$

$$a = -A\omega^2 \cos \omega t$$

$$a = -\omega^2 x$$

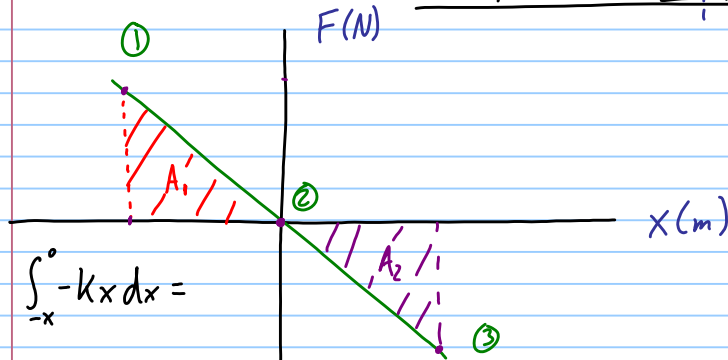
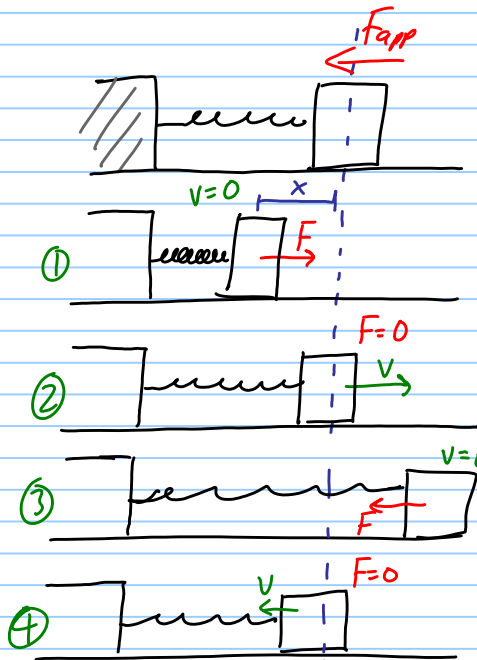
$$\omega = \frac{2\pi}{T}$$

Hook's Law

$$F_s = -kx$$

position \downarrow
Spring force \uparrow Spring constant \uparrow

force is opposite displacement



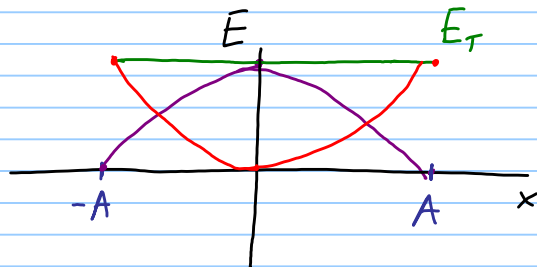
$$\int_{-x}^0 -kx dx =$$

$$A = \frac{1}{2}bh$$

$$W = \frac{1}{2}(x)(F_s)$$

$$W = \frac{1}{2}(x)(-kx)$$

$$W = \frac{1}{2}kx^2$$



E_T E_k E_p

$$E_T = E_K + E_P$$

$$E_T = \frac{1}{2} k A^2$$

$$E_T = \frac{1}{2} m v^2 + \frac{1}{2} k x^2$$

$$\frac{1}{2} k A^2 = \frac{1}{2} m v^2 + \frac{1}{2} k x^2$$

$$v = \pm \sqrt{\frac{k(A^2 - x^2)}{m}}$$

$$m(a = -\omega^2 x)$$

$$m a = -m \omega^2 x$$

$$F = -m \omega^2 x$$

$$T = 2\pi \sqrt{\frac{m}{k}}$$

\Leftrightarrow

$$\omega = \sqrt{\frac{k}{m}}$$

$-kx = -m\omega^2 x$

$$\omega = \frac{2\pi}{T}$$