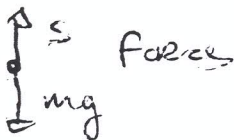
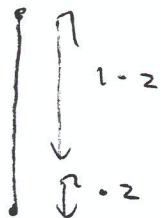


199146

In equil.

$$S = k(x+b) = k(0.2)$$



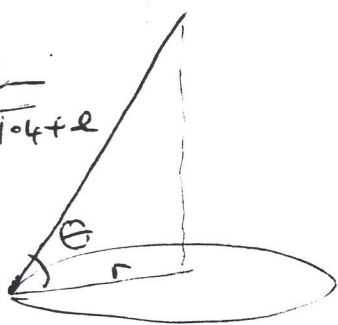
In equil $\downarrow \Sigma F = 0$

$$S - mg = 0$$

$$k(0.2) = mg$$

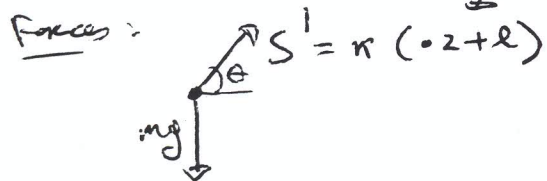
$$\Rightarrow \boxed{k = 5mg}$$

In general
extra extension
 $e:$



$$\cos \theta = \frac{r}{1.4 + l}$$

new extension



$$\downarrow \Sigma F = 0$$

$$\rightarrow \Sigma F = m\omega^2 r$$

$$\Rightarrow S' \cos \theta = m\omega^2 r$$

$$\Rightarrow k(0.2 + l) \frac{r}{1.4 + l} = m\omega^2 r$$

$$\Rightarrow 5mg \left(\frac{0.2 + l}{1.4 + l} \right) = m\omega^2$$

$$\Rightarrow \frac{0.2 + l}{1.4 + l} = \frac{\omega^2}{49}$$

crossing

$$9.8 + 49l = 1.4\omega^2 + \omega^2 l$$

$$(49 - \omega^2)l = 1.4\omega^2 - 9.8$$

$$l = \frac{1.4\omega^2 - 9.8}{49 - \omega^2}$$

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(SHM)

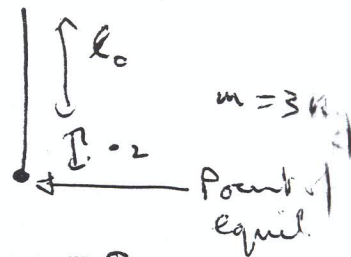
$$k \text{ ext } S = k(x+b) = k(0.2)$$

In equil

$$S - mg = 0$$

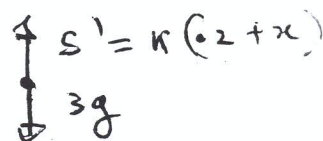
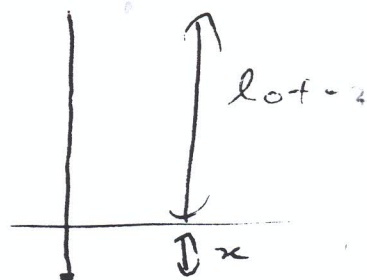
$$k(0.2) = 3g$$

$$\boxed{k = 15g}$$



Typical position

$\oplus \downarrow \ominus \uparrow$



$$\Sigma \vec{F} = ma$$

$$\Rightarrow -k(0.2 + x) + 3g = 3a$$

$$\Rightarrow -15g(0.2 + x) + 3g = 3a$$

$$\Rightarrow -3g + 15gx + 3g = 3a$$

$$\Rightarrow -5gx = a$$

$$g = 9.8 \Rightarrow$$

$$\Rightarrow -49x = a$$

\Rightarrow SHM about $lo + 0.2$

below the fixed point

$$\text{with } \omega = \sqrt{49} = 7$$

$$\Rightarrow \text{Period} = T = \frac{2\pi}{\omega}$$

$$T = \frac{2\pi}{7} \text{ sec}$$