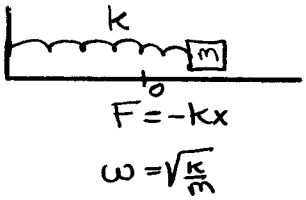
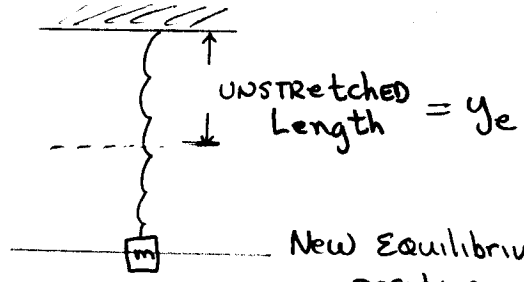
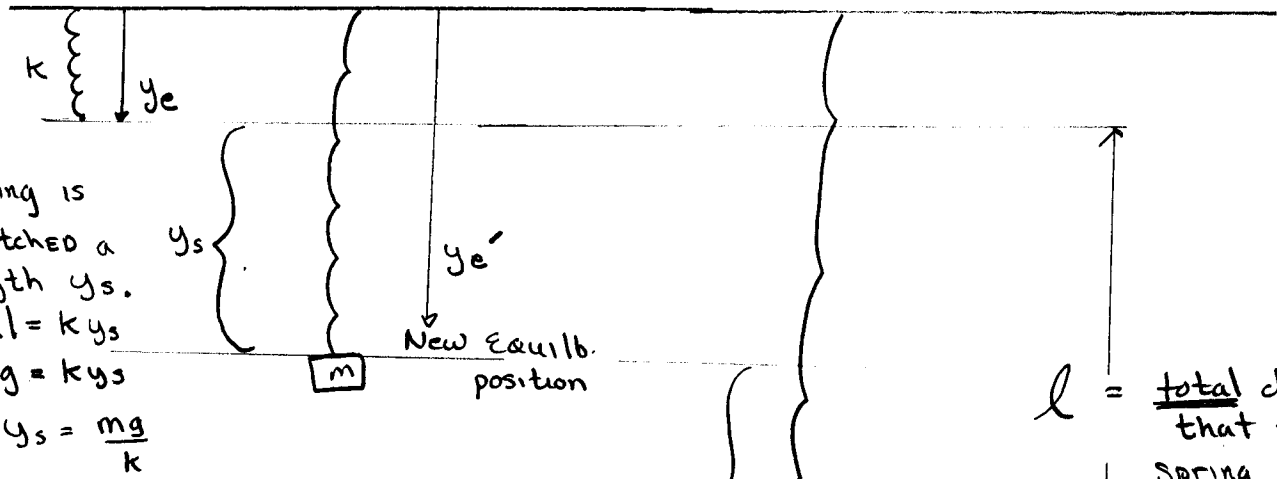
MASS ON A SPRING





How does the additional force of mg affect ω?



Displacement From New Equilb. position is Y.

At point A, the total force on the spring, F_s' is

$$F_s' = -k\ell + mg$$

where $\ell = y_s + Y$, but $y_s = \frac{mg}{k}$, so $\ell = \left(\frac{mg}{k}\right) + Y$

Now $$F_s' = -k\left(\frac{mg}{k} + Y\right) + mg = -k\frac{mg}{k} - kY + mg$$

$$F_s' = -\cancel{mg} - kY + \cancel{mg}$$

$\therefore F_s' = -kY$, where Y is the Displacement from the New Equilibrium position. $\therefore$ All mg does is to shift the equilb. position. [That's why we ignore mg.]

Since $F_s' = -kY = ma$, $m\frac{d^2Y}{dt^2} = -kY$, we STILL have $\omega = \sqrt{\frac{k}{m}}$.

ω is the SAME!