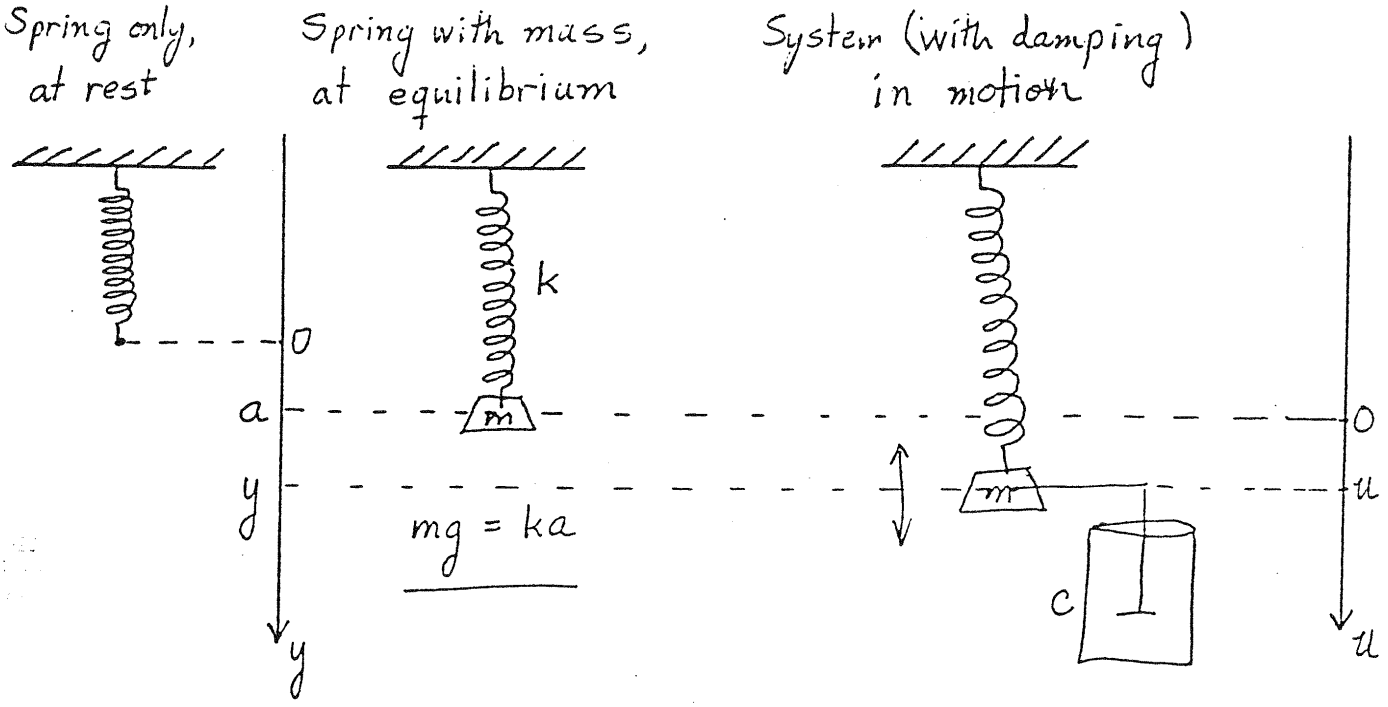
Math 2090 (Tyler) Mechanical Vibrations 2/16/94



t: time in seconds. y or $u = y - a$: displacement in feet

k: Hooke's Law constant of the spring: pounds per foot.

c: damping constant: pounds per foot per second.

Forces acting on the mass along the y (or u) axis:

F ↕ Weight: mg ↓ Spring: $-ky$ ↕ Damping: $-cy'$ ↕

Newton's Law: Total force $= my''$. So:

$$F(t) + mg - cy' - ky = my''; \text{ or}$$

$$my'' + cy' + ky - mg = F$$

(mg equals ka)

or, if $u = y - a$ (so that $y' = u'$, $y'' = u''$):

$$mu'' + cu' + ku = F.$$