HW of Section 1.2. 1/6/05

1) $\sum \vec{F} = m\vec{a}$ ← Net Forces acting on the body; → Acceleration of the body; ↓+ Given!

$\Rightarrow mg - kv = m\frac{dv}{dt}$

$\Rightarrow \frac{dv}{dt} + \frac{k}{m}v = g.$

3) $a = \frac{k}{r^2}$

a) $r = R,\ a = g \rightarrow g = \frac{k}{R^2} \rightarrow \boxed{k = gR^2}$

b) ↓+

$\frac{d^2r}{dt^2} = +a$

$\frac{d^2r}{dt^2} = g\frac{R^2}{r^2} \rightarrow \frac{d^2r}{dt^2} - g\frac{R^2}{r^2} = 0$

c) $\frac{d^2r}{dt^2} = \frac{dv}{dt} = \frac{dv}{dr}\cdot\frac{dr}{dt}$; but $v = \frac{dr}{dt}$

$\rightarrow v\frac{dv}{dr} - \frac{gR^2}{r^2} = 0.$

4) a) $\sum F = m\frac{d^2r}{dt^2}$ ↓+ down

$mg\frac{R^2}{r^2} - kv = m\frac{d^2r}{dt^2}$

$\frac{d^2r}{dt^2} + \frac{k}{m}v = g\frac{R^2}{r^2}$

Near the Surface $r \cong R$

$\rightarrow \frac{d^2r}{dt^2} + \frac{k}{m}v = g$

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#10) $\frac{dA}{dt} = -kA+1 \quad k>0.$

#11) $I_n - mat = \text{Rate of Change}$

$r - kx = \frac{dx}{dt}$

$\frac{dx}{dt} + kx = r \quad , \quad k>0$

#21) $\frac{dA}{dt} = k(M-A)$

#22) $\frac{dA}{dt} = k_1(M-A) - k_2 A$

natural Logotten