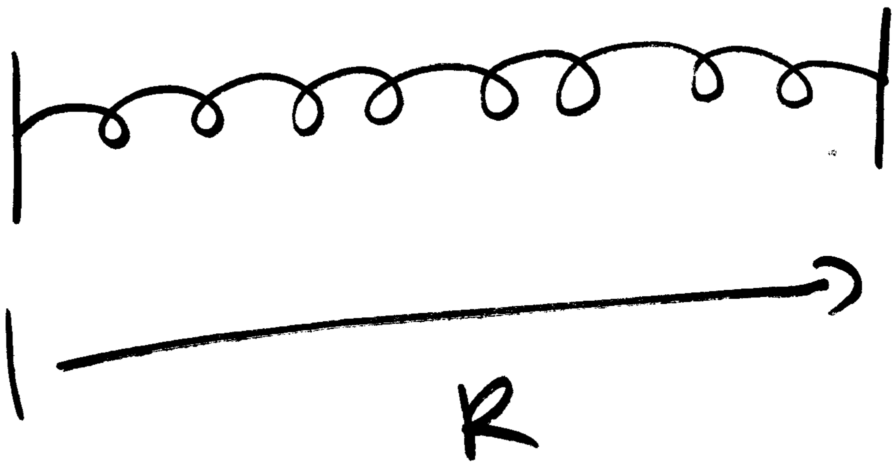
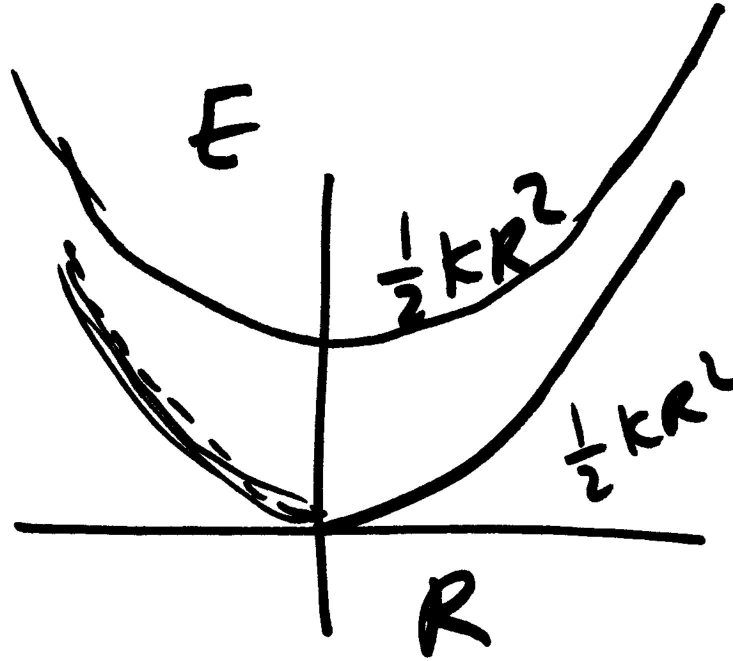
Prof. Ranjith. P (L-12)
17/9/11

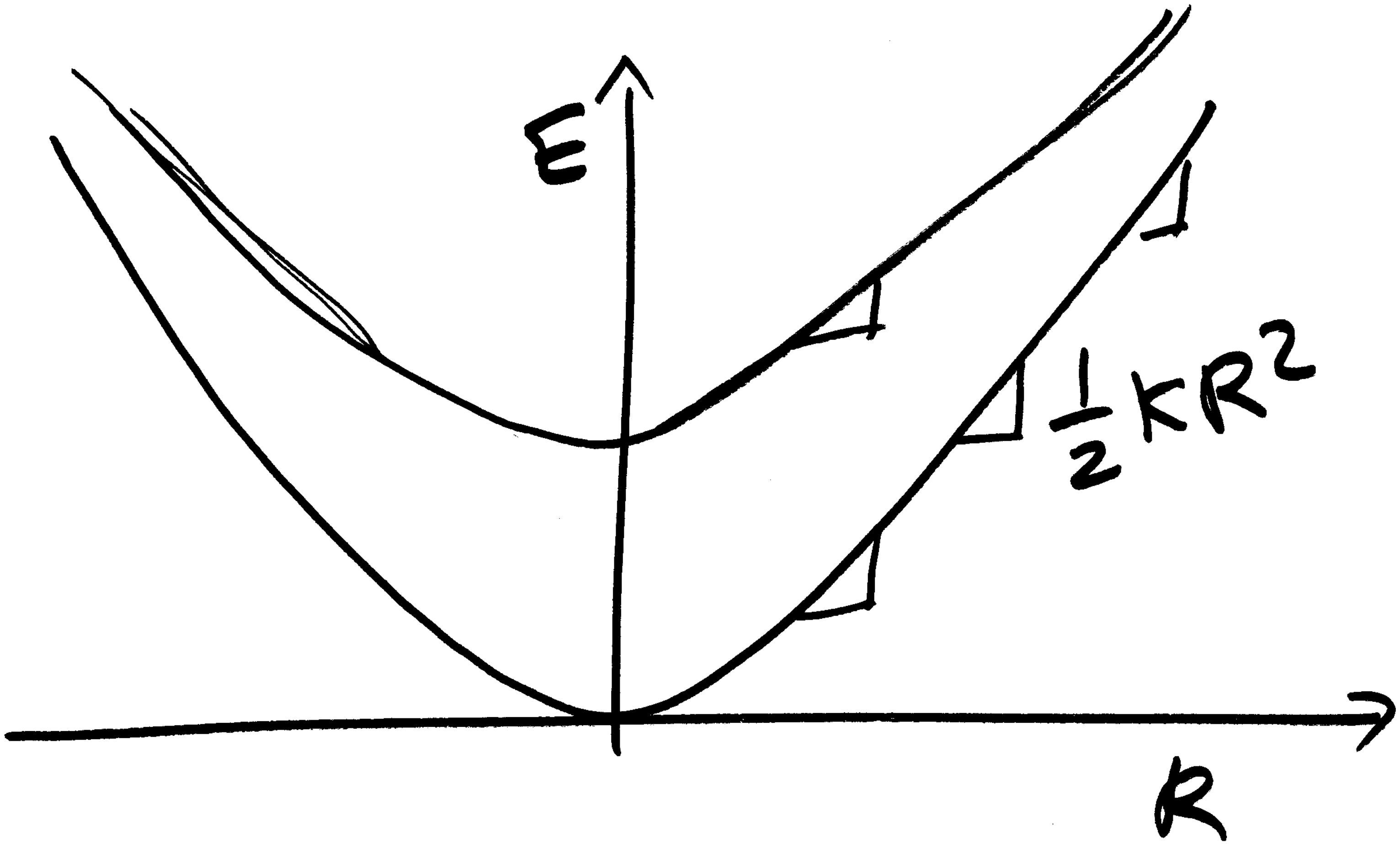
$$\frac{dy}{dt} = f(y,t)$$



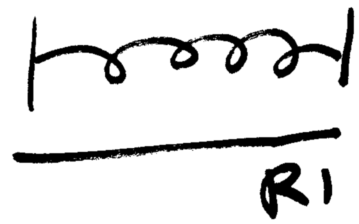


$$f \propto -R$$

$$E = \frac{1}{2} k R^2 + C$$


E
$\frac{1}{2}KR^2$
R

$$\int dE = \int_{R_1}^{R_2} kR\,dR$$



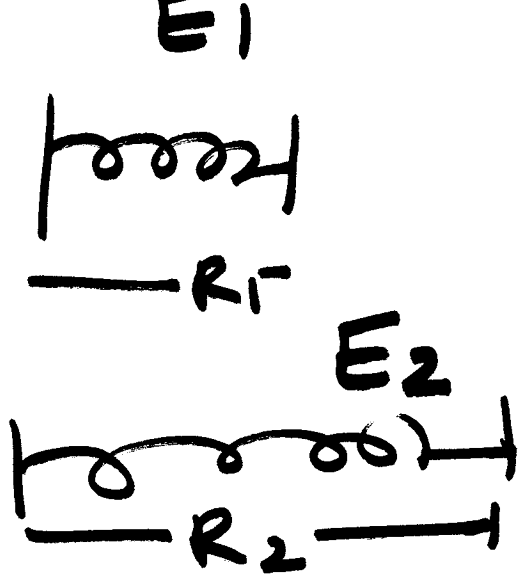
$$E = k\frac{R^2}{2}\Bigg|_{R_1}^{R_2}$$

$$\boxed{= \frac{k}{2}\left[R_2^2 - R_1^2\right]} = \boxed{\frac{k}{2}R_2^2 - \frac{k}{2}R_1^2}$$

3

$$E = \frac{k}{2} R_2^2 - \frac{k}{2} R_1^2$$

$$= E_2 - E_1$$



$$\int R^{-2}\, dR$$

$$= \frac{R^{-2+1}}{-2+1} + \text{constant}$$

$$= -R^{-1} + \text{constant}.$$

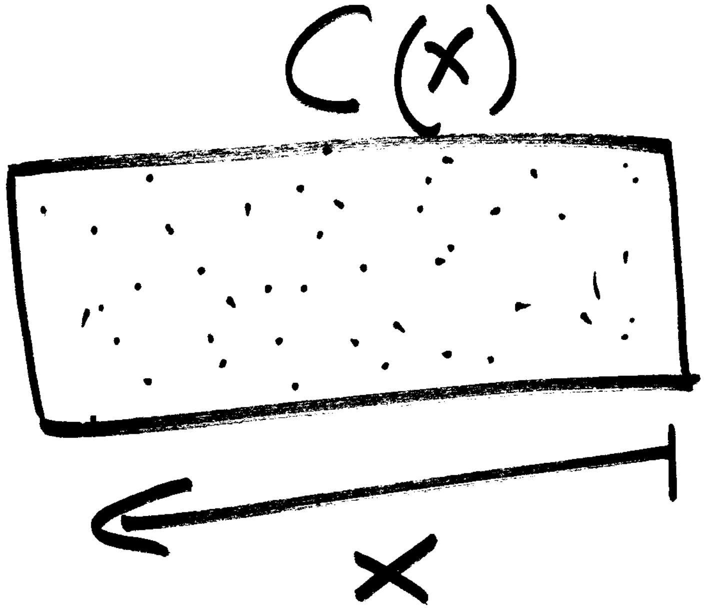
$$= -\frac{1}{R} + \text{constant}$$

Potential energy $\Big\} = \dfrac{q^2}{4\pi \varepsilon_0 \varepsilon_r R^2}$

$$-\frac{q^2}{4\pi \varepsilon_0 \varepsilon_r} \int_{R_1}^{R_2} \frac{1}{R^2}\, dR$$

$$-\frac{q^2}{4\pi\epsilon_0\epsilon_r}\int_{R_1}^{R_2}\frac{1}{R^2}\,dR$$

$$= \frac{+q^2}{4\pi\epsilon_0\epsilon_r}\left[\left.\frac{1}{R}\right|_{R_1}^{R_2}\right] = \frac{q^2}{4\pi\epsilon_0\epsilon_r}\left[\frac{1}{R_2}-\frac{1}{R_1}\right]$$



$$\frac{dC}{dx} = 0$$

$\Rightarrow C =$ constant

$$\int dC = \int 0$$

$C =$ Constant

7.1

$$\frac{dx}{dt} = (\ )$$

first-order ordinary differential equations

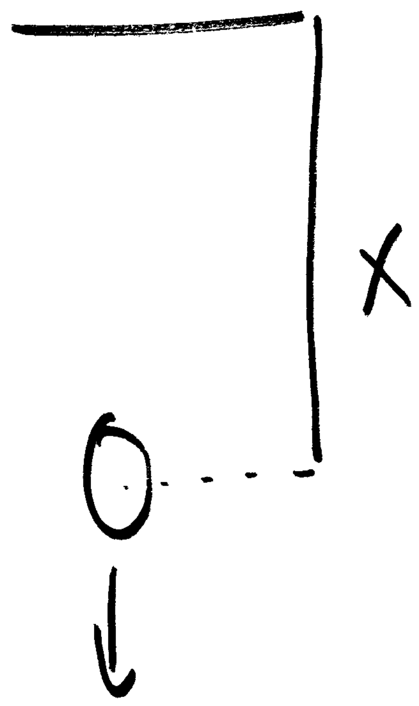
$$m\frac{d^2x}{dt^2} = f$$

$$\boxed{ma = f}$$

$$a = \frac{dv}{dt} = \underline{\frac{d}{dt}\left(\frac{dx}{dt}\right)}$$

$$\left(\frac{d^2x}{dt^2}\right)$$

9.1


x

$$\frac{dv}{dt} = g$$

$$\int dv = \int g\,dt$$

$$v(t) = gt + \text{constant}$$

$$v(0) = \text{constant}$$

$$v(t) = gt + v(0)$$

$$\frac{dx}{dt} = gt + v_0$$

$$\int dx = \int (gt + v_0)\, dt$$

$$= \int gt\, dt + \int v_0\, dt$$

$$x(t) = g\frac{t^2}{2} + v_0 t + C$$

$$C = x(t=0)$$

$$x(t) = \underline{\underline{g}}\,t^2 + \underline{v_0}t + \underline{x_0}$$

$$x(3) = g3^2 + \underline{\underline{v_0}}.3 + x_0$$

$$x(3) = 10 \cdot 3^2 + 1 \cdot 5$$

$$= 90 + 1 \cdot 5$$

$$= \underline{\underline{91 \cdot 5}}\ m$$