standard 15.pdf

Tuesday, December 5, 2023 4:26 PM

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Standard 15

$$F = m\ddot{x} = -\frac{dU}{dx} = m\frac{d}{dt}\frac{dx}{dt} \qquad \frac{1}{2}\left(\frac{dx}{dt}\right)^2$$

$$-\frac{dU}{dx}\frac{dx}{dt} = m\frac{d}{dt}\frac{dx}{dt}\frac{dx}{dt}$$

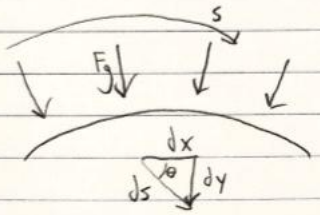
$$-\frac{dU}{dt} = \frac{1}{2}m\left(\frac{dx}{dt}\right)^2$$

$$-\Delta U = \Delta T$$

$$F_s = ma_s = m\underbrace{\frac{dv_s}{dt}} = m\frac{dv_s}{ds}\underbrace{\frac{ds}{dt}} = mv_s\frac{dv_s}{ds}$$

a $\qquad$ v

For particle in a gravitational field moving in the s-direction



$$F_g = -mgy$$

$$F_s = -mg\sin\theta = -mg\frac{dy}{ds}$$

$$\sin\theta = \frac{dy}{ds}$$

$$mv_s\frac{dv_s}{ds} = -mg\frac{dy}{ds}$$

$$mv_s\,dv_s = -mg\,dy$$

$$\int_0^{v_s} mv_s\,dv_s = -\int_0^h mg\,dy$$

$$\frac{1}{2}mv_s^2 = -\frac{1}{2}mgh$$

$$T = -U$$