

Class 10 - October 17, 2005

§ 10.2 - Kinetic Energy & Grav. Potential Energy

Egn 2.22

$a = \text{const}$

$$v_{fs}^2 = v_{is}^2 + 2 a_s \Delta s$$

Free Fall

y

$s \rightarrow y$



$$\frac{1}{2} m v_{fy}^2 - \frac{1}{2} m v_{iy}^2 = -mg(y_f - y_i)$$

$$\frac{1}{2} m v_{fy}^2 + mgy_f = \frac{1}{2} m v_{iy}^2 + mgy_i$$

Egn 10.10.

$$K \equiv \frac{1}{2} m v^2 = \text{kinetic energy}$$

$$U_g = m g y \equiv \text{gravitational potential energy}$$

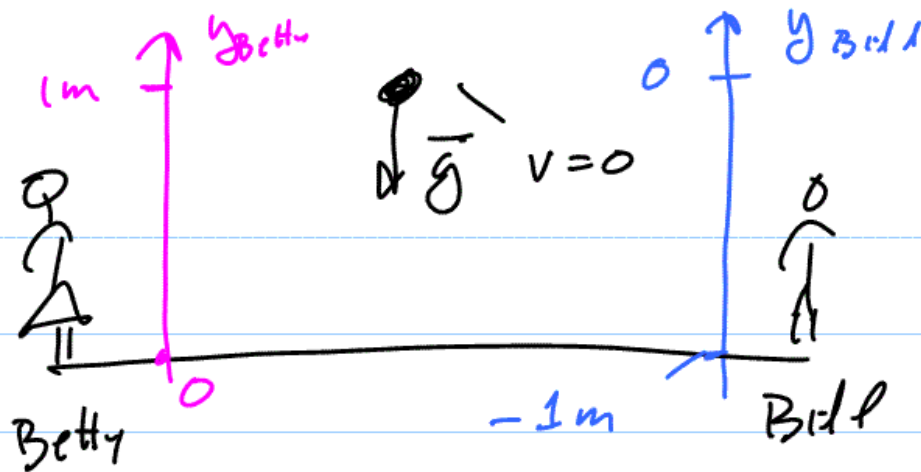
Free fall' $K + U_g = \text{constant}$

$$\text{UNIT: } \text{kg m}^2/\text{s}^2 \equiv \text{joule J}$$

Zero of U_g

coordinate system
arbitrary

- includes choice of
origin



Betty $\frac{1}{2} m v_i^2 + m g y_i$

$$0 + m g (1m) = \frac{1}{2} m v_f^2 + m g y_f$$

$$\frac{1}{2} m v_f^2 = m g (1m)$$

$$v_f = \sqrt{2 g \times (1m)}$$

Bill $\frac{1}{2} m v_i^2 + m g y_i$

$$0 + 0 = \quad -1m$$

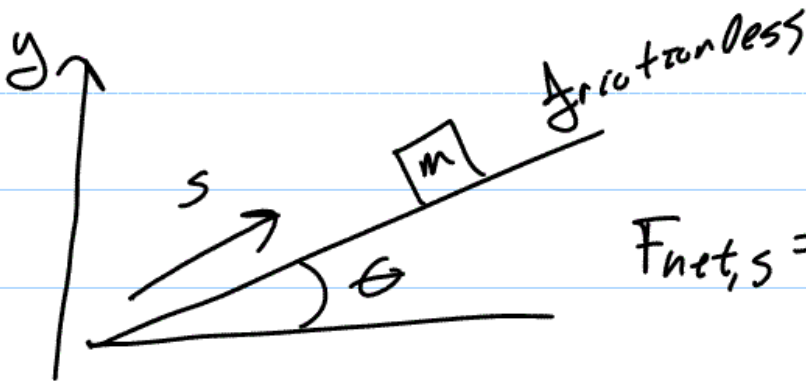
$$\frac{1}{2} m v_f^2 + m g y_f$$

$$0 = \frac{1}{2} m v_f^2 - m g$$

$$K_i + U_{gi} = K_f + U_{gf}$$

$$\Delta K = -\Delta U$$

§10.3 Closer Look



$$F_{\text{net},s} = m \frac{d^2 s}{dt^2}$$

CHAIN RULE -

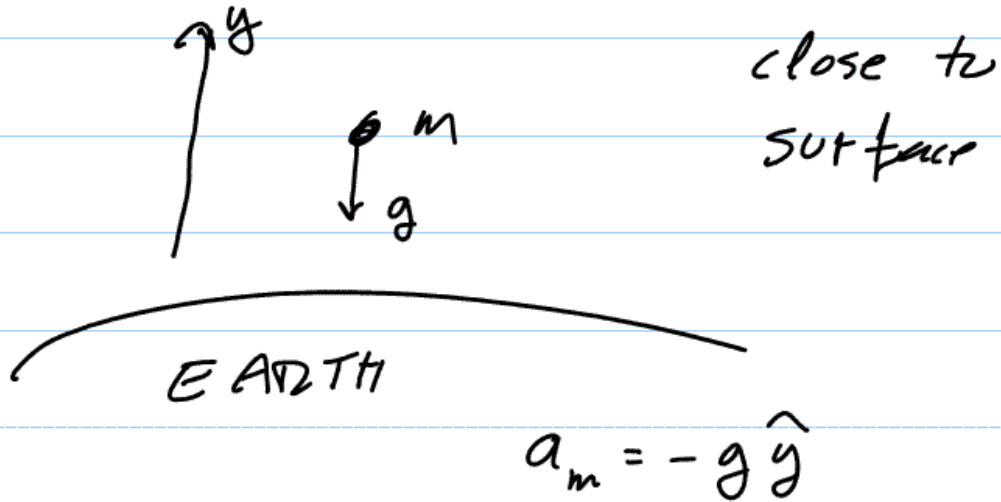
this week in MAT135

$$\Rightarrow K + U_g = \text{const}$$

$$U_g = mgy$$

Gravitational Field

not in
text



Newton! gravity is "action
at a distance"

Divide into 2 pieces'

① Earth creates a gravitational
field everywhere around
it

② Mass m in field has a force exerted on it by the field

\vec{E}_g - grav. field

$$\vec{E}_g = -g\hat{y}$$

$$\vec{F} = m\vec{E}_g = -mg\hat{y}$$

$$U_g = mgy$$

stored in
grav. field