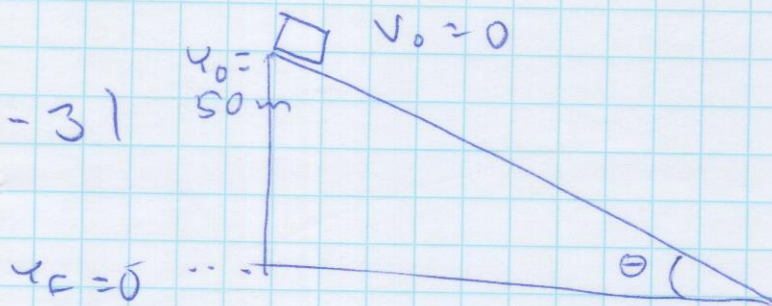


10-31

Don't know θ
or d .But $\Delta y = 50\text{m}$ System is car +
hill + earth: so
no external work

$$\Delta E = W$$

$$E_f - E_0 = 0$$

$$\frac{1}{2}mv_f^2 + mgy_f = \frac{1}{2}mv_0^2 + mgy_0$$

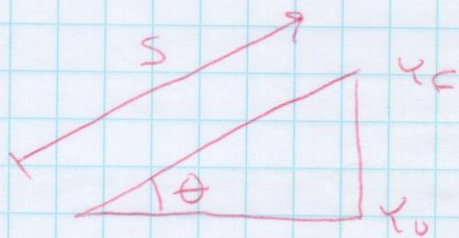
$$\frac{1}{2}v_f^2 - \frac{1}{2}v_0^2 = g y_0 - g y_f$$

$$\frac{1}{2}v_f^2 - 0 = g(y_0 - y_f)$$

$$v_f^2 = 2(9.8 \text{ m/s}^2)(50 - 0 \text{ m})$$

$$v_f = 31.3 \text{ m/s}$$

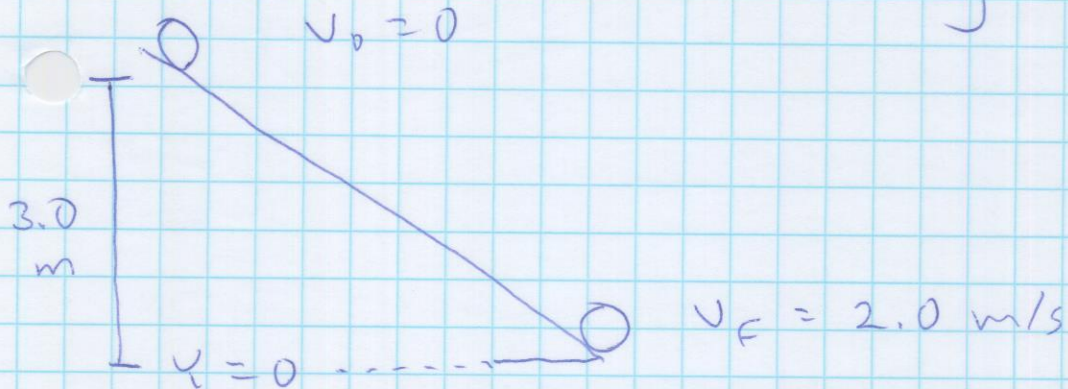
Talk Geometry:

If $y_0 = 0$,
 $y_f =$ height
of hill.

$$\sin \theta = \frac{y_f}{s}$$

10-37

$$m = 20 \text{ kg}$$



Starts with U_g only.

As go down, $U_g \rightarrow K$ and E_{TH}

My system is Girl + Slide + Earth. All these are within system.

$$K_f + U_{gf} + \Delta E_{TH} = K_0 + U_{g0} + W$$

$$\frac{1}{2}mv_f^2 + 0 + \Delta E_{TH} = 0 + mgY_0 + 0$$

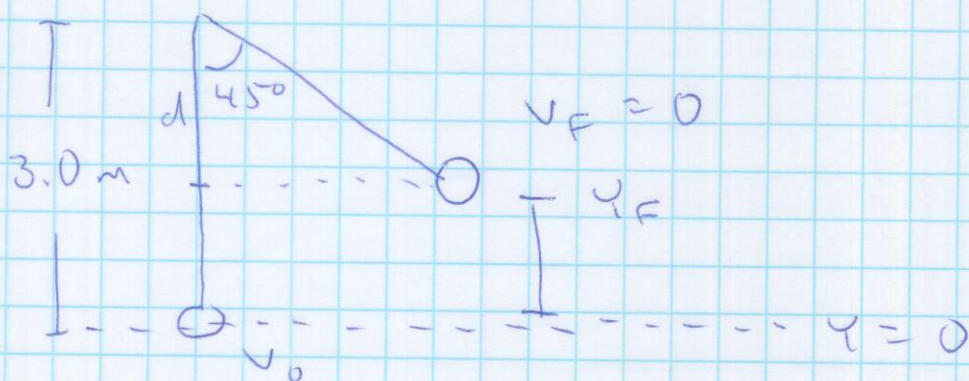
$$\Delta E_{TH} = mgY_0 - \frac{1}{2}mv_f^2$$

$$\Delta E_{TH} = (20)(9.8)(3.0) - \frac{1}{2}(20)(2.0)^2$$

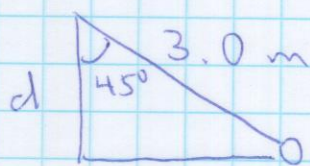
$$\Delta E_{TH} = 548 \text{ J}$$

Positive. Pants and slide gain thermal energy

10-58



System is Student + Swing + Earth



$$\cos 45^\circ = d/3$$

$$d = 2.12 \text{ m}$$

$$\text{so } Y_F = 3 - d = 0.88 \text{ m}$$

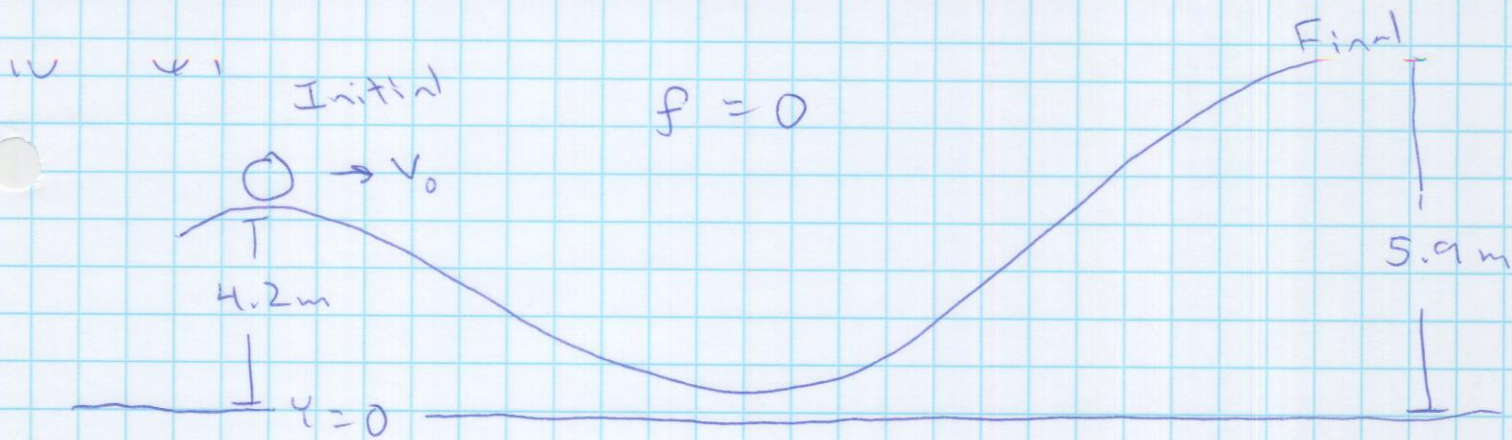
$$K_F + U_{gF} + \Delta E_{TH} = K_0 + U_{g0} + W$$

$$0 + mgY_F + 0 = \frac{1}{2}mv_0^2 + 0 + 0$$

$$v_0^2 = 2gY_F$$

$$v_0 = \sqrt{2(9.8)(0.88)}$$

$$v_0 = 4.15 \text{ m/s}$$



$$K_F + U_{gF} + \Delta E_{TH} = K_0 + U_{g0} + W$$

System is Sled + Hill + Earth. No external work.

If just barely makes it up second hill, $v_F = 0$.

$$0 + mgY_F + 0 = \frac{1}{2}mv_0^2 + mgY_0 + 0$$

$$\frac{1}{2}mv_0^2 = mg(Y_F - Y_0)$$

$$v_0^2 = 2g(Y_F - Y_0)$$

$$v_0^2 = 2(9.8)[5.9 - 4.2]$$

$$v_0 = 5.77 \text{ m/s}$$