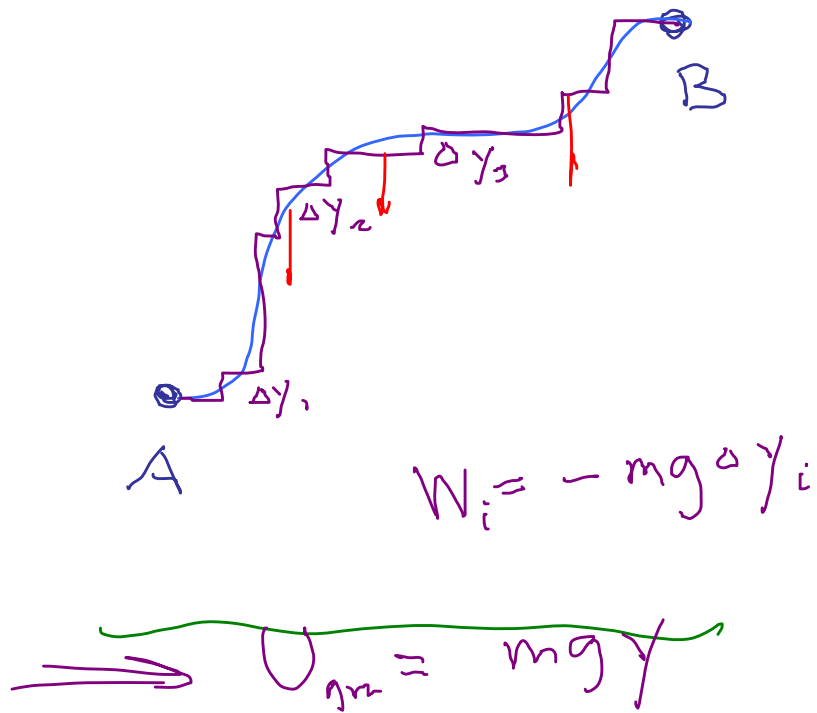


Work done gravity (Potential energy)

Work done by gravity

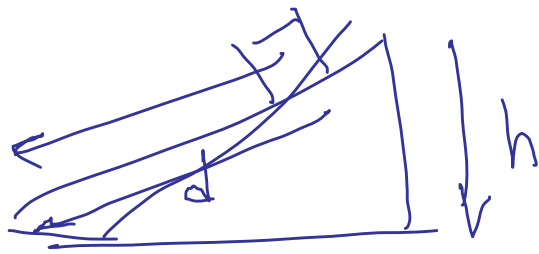


$$W = \sum_i -mg \Delta y_i = -mg(\gamma_B - \gamma_A)$$

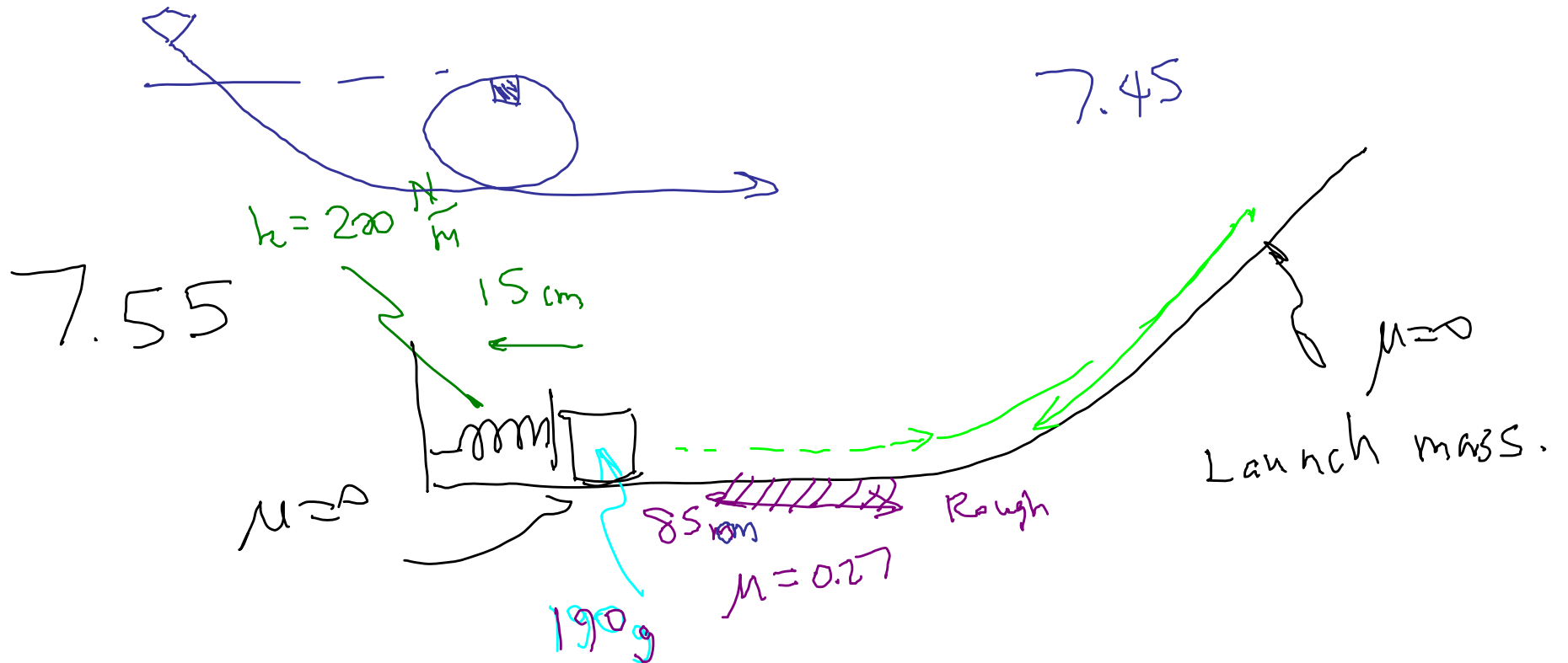
$$= -mg \sum_i \Delta y_i$$

Diagram illustrating the work done by gravity for a vertical displacement h upwards. The work done is $W = -mgh$.

Diagram illustrating the work done by gravity for a vertical displacement h downwards. The work done is $W = mgh$.



$$\Delta U = mg \Delta y$$



7.55 Block is launched. After it's launched
Where does block come to rest?
Measure from left end of frictional
zone.

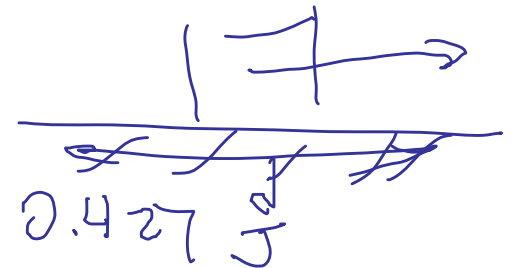
Initially, mech energy is

$$E_0 = \frac{1}{2} kx^2 = \frac{1}{2} (200 \frac{\text{N}}{\text{m}}) (0.15 \text{ m})^2$$
$$= 2.25 \text{ J}$$

$$f_k = \mu_k mg$$

Full pass over friction part

$$W_{f_k} = -f_k d$$
$$= -0.427 \text{ J}$$

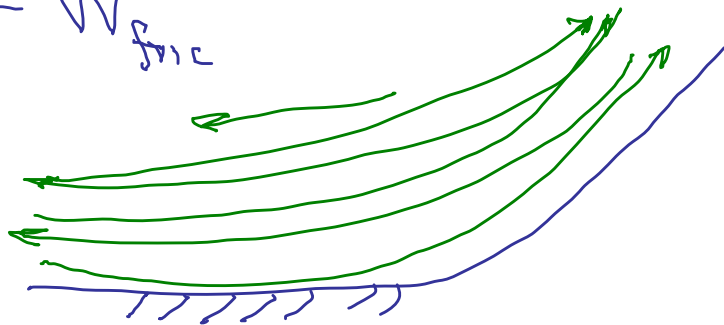


$$\# \text{ passes} = \frac{2.25}{0.427} = 5.27$$

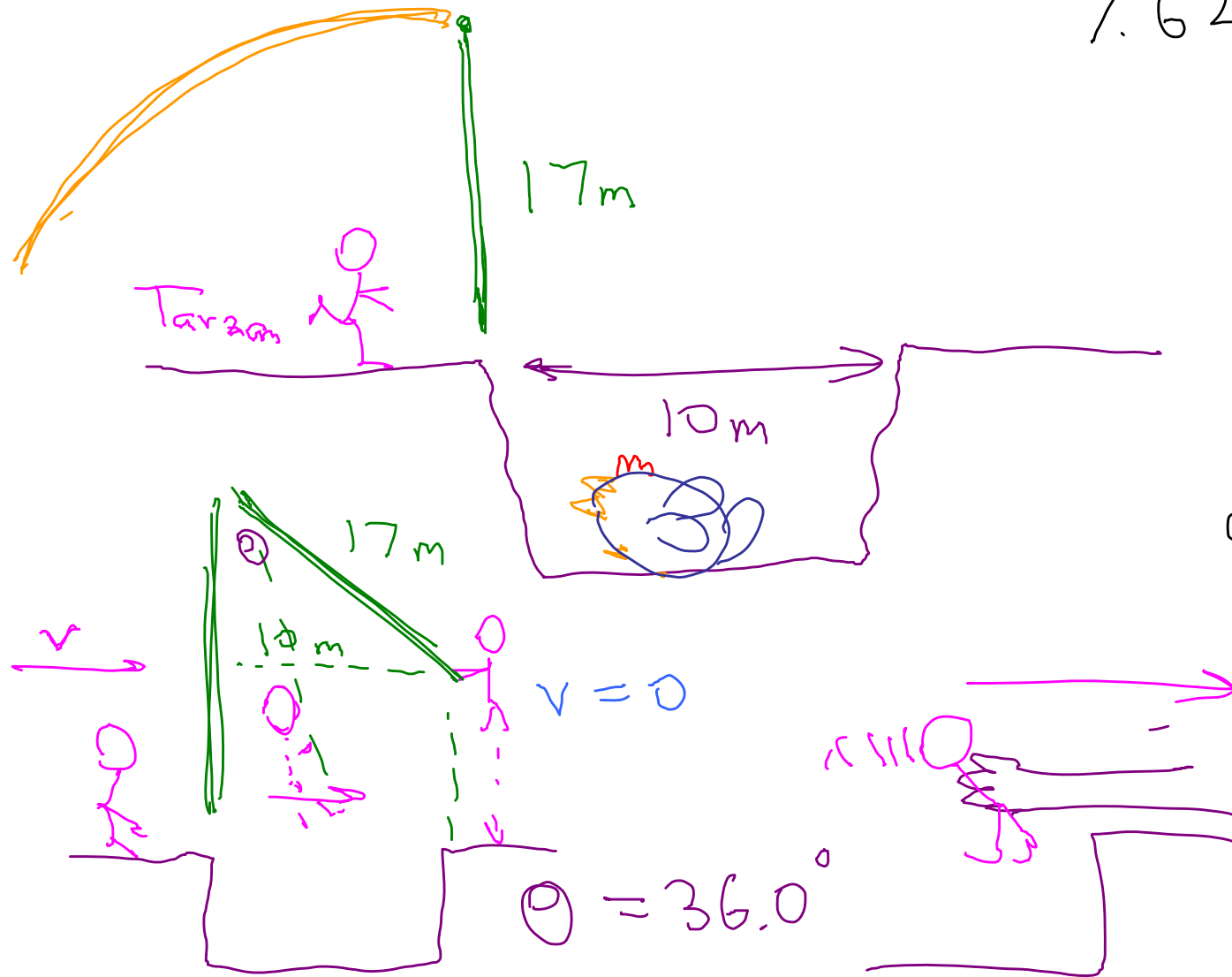
→ 5 complete pass.

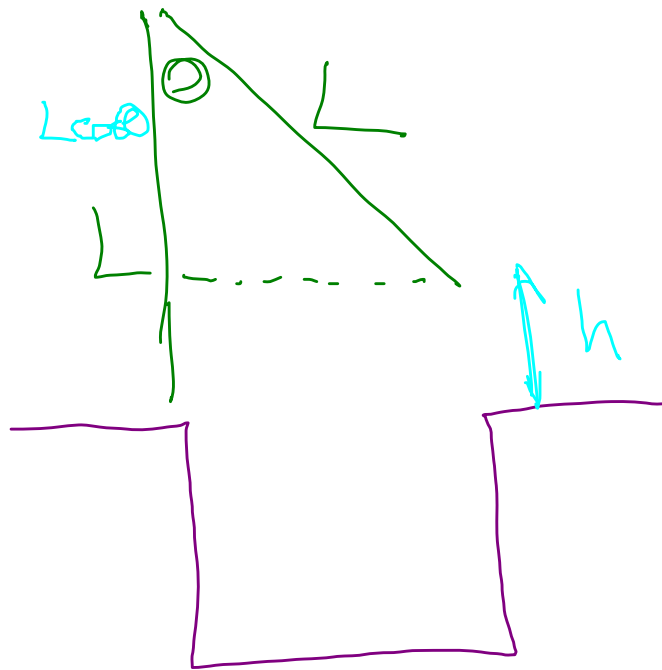
On last pass, it can go 0.27 of the way

$$\Delta E = W_{\text{fric}} (0.27)(85 \text{ cm}) = 22.5 \text{ cm}$$



7.62 17 m long
vine hangs
vertically
Tarzan runs
grabs vine
Must get
across, how
fast must
he run?





$$h = L - L \cos \theta$$
$$= L (1 - \cos \theta)$$

Cons of energy

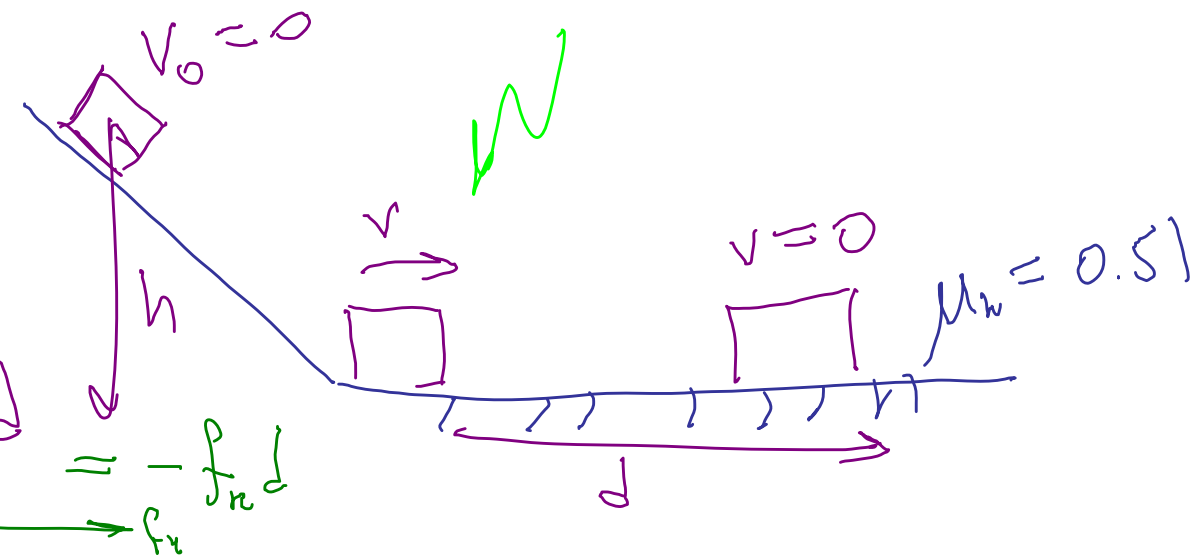
$$\frac{1}{2} m v^2 = mgh$$

$$v = 7.98 \frac{\text{m}}{\text{s}}$$

7.59 A child sleds down frictionless hill whose vertical drop is 7.2m. At bottom is a level but rough stretch where $\mu_k = 0.51$. How far does sled slide across level stretch

$$\Delta E = W_{\text{fric}}$$

$$(0 + 0) - (mgh)$$

$$= W_{\text{fric}} = -\underbrace{\mu_k mg d}_{f_k} = -f_k d$$


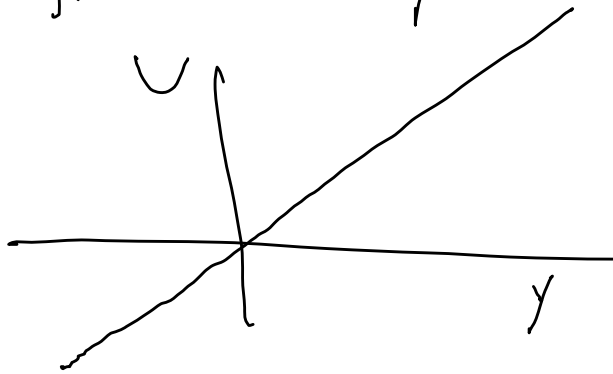
The diagram illustrates the physics problem. A sled starts at the top of a hill with initial velocity $v_0 = 0$. It slides down a hill with a vertical drop h . At the bottom of the hill, the sled enters a horizontal stretch of length d with a coefficient of friction $\mu_k = 0.51$. The sled's velocity at the end of the stretch is $v = 0$. A green checkmark is next to the diagram.

$$\cancel{mgh} = \mu_n \cancel{mgd}$$

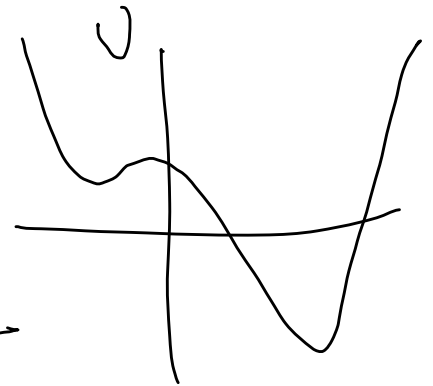
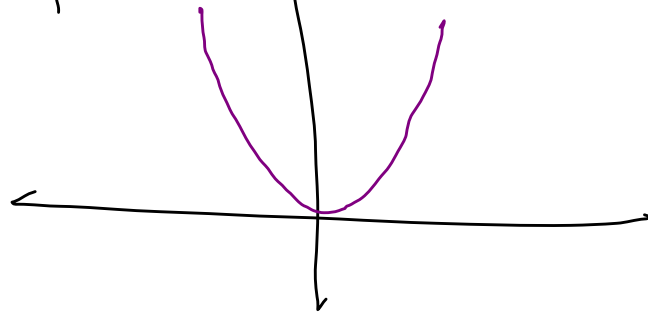
$$d = \frac{h}{\mu_n} = \frac{7.2 \text{ m}}{0.51} = 14.1 \text{ m}$$

General features of $U(x)$ potential function

$$U_{\text{gra}} = mgy$$



$$U_{\text{spring}} = \frac{1}{2} kx^2$$



$$\Delta U \approx -W_{ab}$$

$$= - \int_0^x F(x') dx'$$

