Activity 7, Analyzing Free Fall Motion

Slowing to stop

Jumping with Legs

$y = .50mm \left(\dfrac{1m}{1000mm}\right)$
$= .5 \times 10^{-4} m$

$y = 0$

$\begin{cases} t_2 = \\ y_2 = ? \\ v_{2y} = 0 \text{ (max Ht)} \end{cases}$

$\begin{cases} t_1 = \\ y_1 = 5 \times 10^{-4} m \\ v_{1y} = \boxed{1 \, m/s} \end{cases}$

$\begin{cases} t_0 = 0 \\ y_0 = 0 \\ v_{0y} = 0 \end{cases}$

constant acceleration
(free fall)
$\vec{a} \downarrow \quad a_{1y} = -10 \, m/s^2$

constant acceleration
$\vec{a} \uparrow \quad a_{0y} = 1000 \, m/s^2$
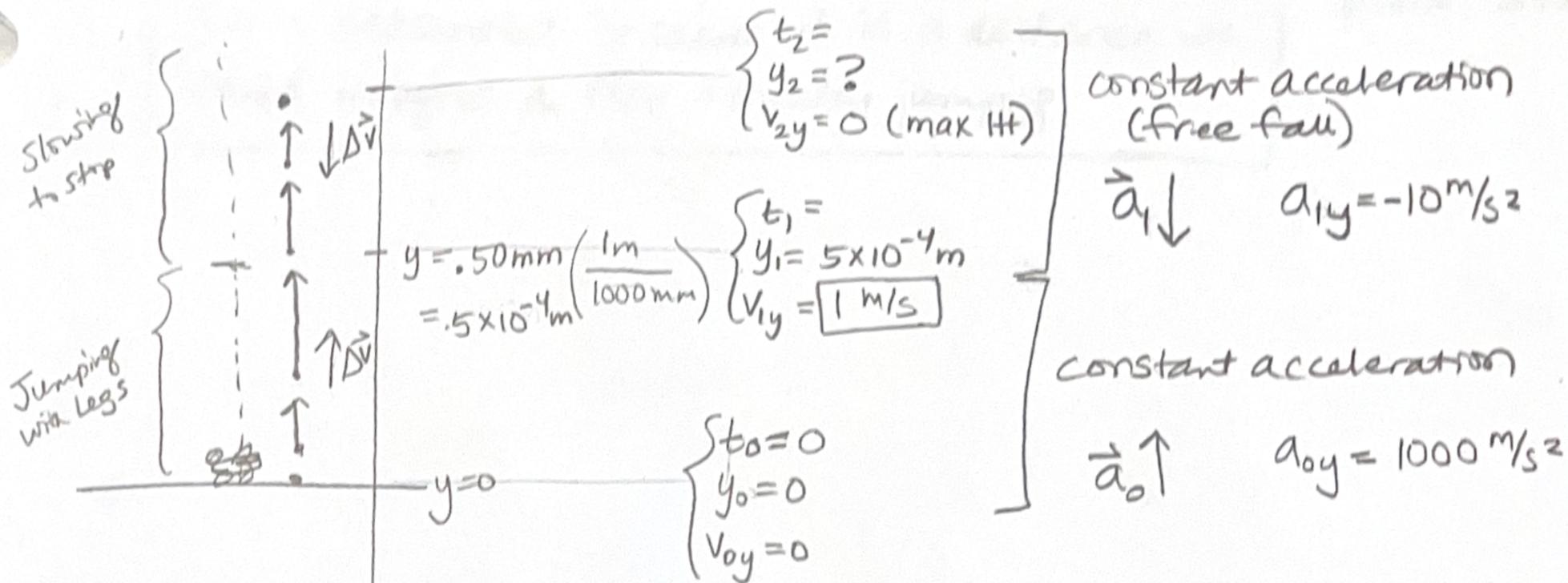
For flea jump, t_0 to t_1, Find v_{fy} because this is initial velocity for the next time interval.
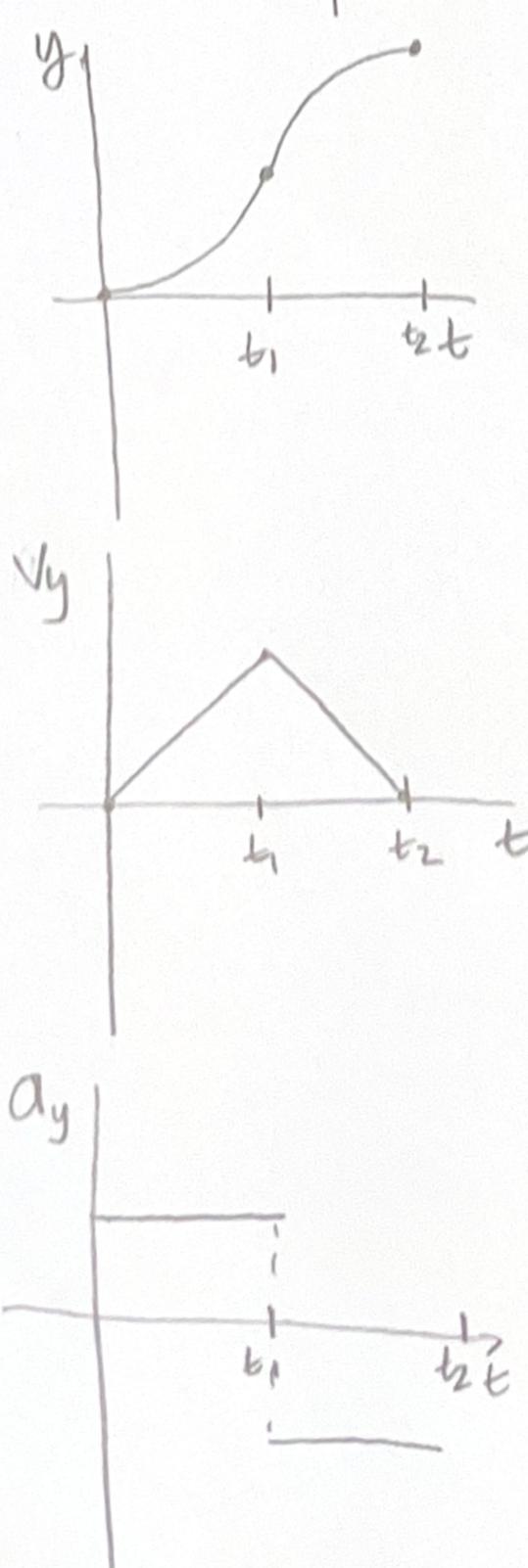
$\Delta y = \checkmark$
$v_{iy} = \checkmark$
$v_{fy} =$
$a_y = \checkmark$
$\Delta t =$

$v_{fy}^2 = v_{iy}^2 + 2a_y \Delta y$

$v_{1y}^2 = \cancel{v_{0y}^2}^{\,0} + 2a_{0y} \Delta y$

$v_{1y} = \sqrt{2 a_{0y} \Delta y}$

$= \sqrt{2(1000 \, m/s^2)(5 \times 10^{-4} m)}$

$= \pm 1 \, m/s$

choose + velocity, so $v_{1y} = \boxed{1 \, m/s}$

For free fall, find Δy y_2, from t_1 to t_2

$\Delta y = ?$
$v_{iy} = \checkmark$
$v_{fy} = \checkmark$
$a_y = \checkmark$
Δt

$v_{fy}^2 = v_{iy}^2 + 2a_y \Delta y$

$v_{2y}^2 = v_{1y}^2 + 2a_{1y}(y_2 - y_1)$

$\dfrac{v_{2y}^2 - v_{1y}^2}{2a_{1y}} + y_1 = y_2$

$\dfrac{0 - (1 \, m/s^2)}{2(-10 \, m/s^2)} + 5 \times 10^{-4} m = y_2$

$.0505 m = y_2$

$\boxed{5.1 \, cm} = y_2$

The flea goes 5.1 cm high above the ground.

This is reasonable because it is a distance we could imagine a flea actually jumping.