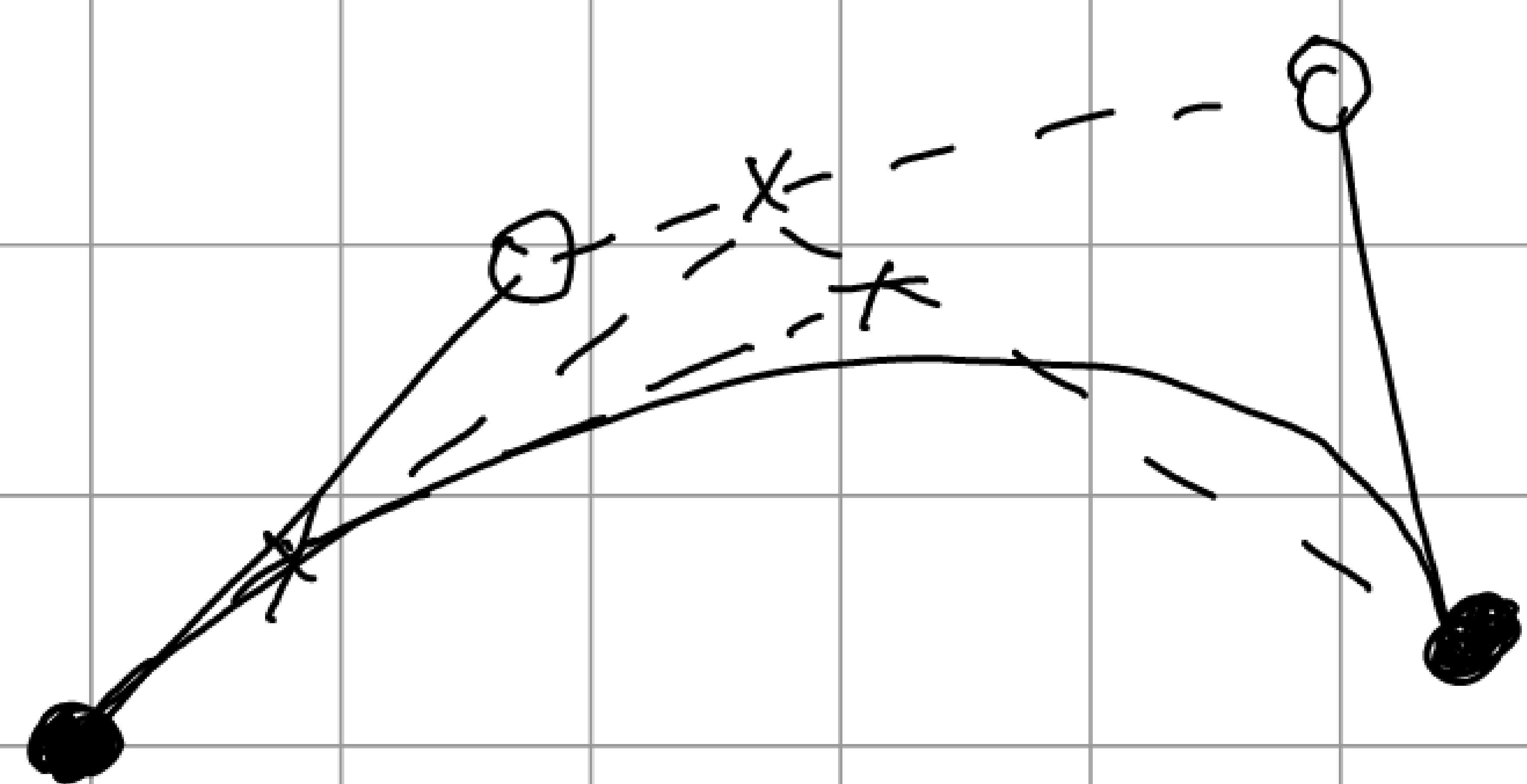
$x, y = \text{spline}(s, \overline{\text{start}}, \overline{\text{end}}, \overline{\text{ctrl}}, \overline{\text{ctr2}})$



Ver $\underline{1}$: Cubic Bezier

Points Array :

$p(i) = [\overline{\text{pos}}, \overline{\text{magIn}}, \overline{\text{magout}}, H, \text{useH?}, \text{usePos?}]$

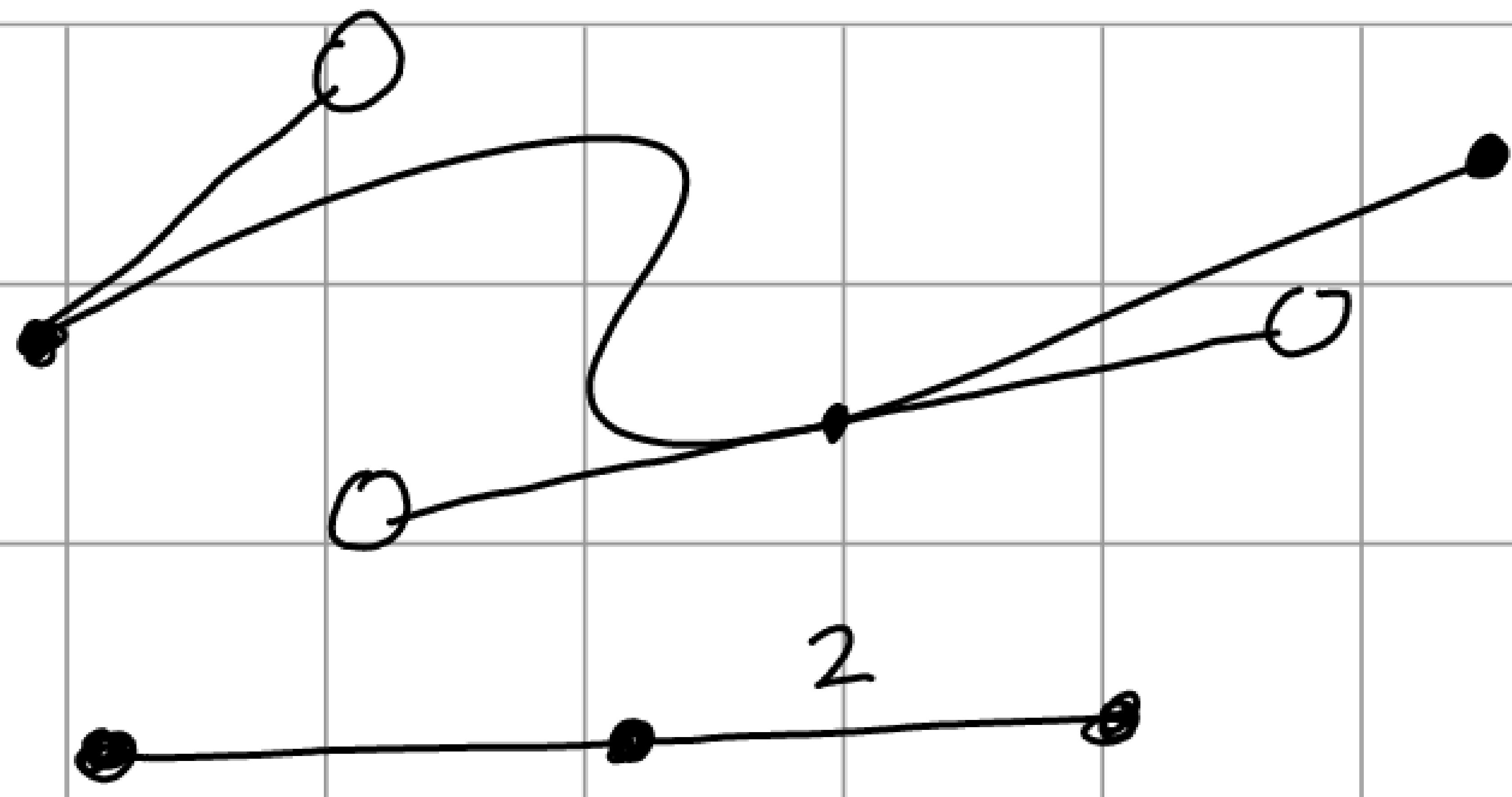
?

$A_m = A_{max}$ motors

r - "רדיוס" סיבוב

Segment → $s : [0 \dots 1]$

dx - צעד קטן



① Calc length L_i per segment, Total L

② $ds_i = \frac{dx}{L_i}$

③ array of $\sum \frac{1}{ds_i}$ Points : $s, d, x, y, \alpha, v, H, \omega, t$

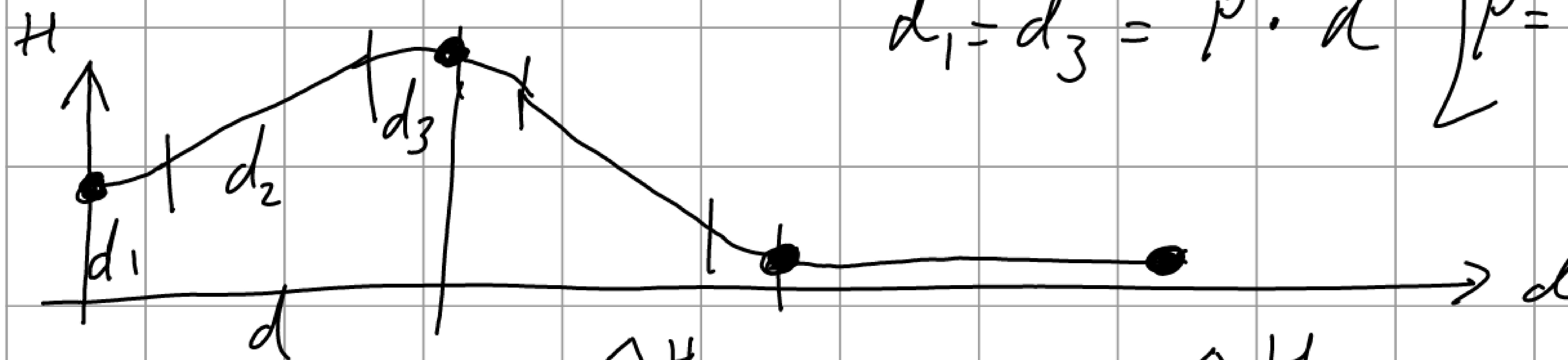
④ Fill s, x, y, d, v_{max} per segment

⑤ centrifugal force $\frac{1}{R} = \frac{d\alpha}{dd}$ $V = Min\left(v_i, \sqrt{R \cdot A_{Skid}}\right)$

Heading

⑥

$d_1 = d_3 = p \cdot d$ $[p = 0.05]$



$$\omega = \frac{\Delta H}{(1-p)d} \qquad a = \frac{\Delta H}{2p(1-p)d^2}$$

$$H = \begin{cases} x < p \cdot d & : a x^2 \\ p \cdot d \le x \le (1-p)d & : a(p \cdot d)^2 + \omega(x - pd) \\ (1-p)d < x & : \Delta H - a(d-x)^2 \end{cases}$$

Forward Run : t, a, v all points

⑦ $\boxed{dx \to dt}$

$$dt = \frac{dx}{v_{i-1}}, \quad \omega = \frac{H_i - H_{i-1}}{dt}$$

$$v_m = V_{max} - \omega \cdot r$$

למניכו_ מינ׳ס של הכוכבים בכלל

⑧ $$a_i = \min\left(A_{skid},\ a_{i-1} + J\,dt,\ A_m \frac{V_m - V_{i-1}}{V_m}\right)$$

$$v_i = \min\left(v_i,\ v_{i-1} + a_{i-1}\,dt + \tfrac{1}{2} J\,dt^2,\ v_m\right)$$

$$t_i = t_{i-1} + dt$$

✱ Repeat 7, 8 for all points

Reverse Run t, a, v all points

⑨ Same as ⑦, ⑧ loop, BUT:

① $i+1$ instead of $i-1$

② $N-1 \to 0$ instead of $1 \to N$
(Loop in reverse)

③ for a_i use A_m instead of $A_m \frac{V_m - V_{i-1}}{V_m}$

Gaps: ① $\dot{\omega}$ not optimal...

② ∞ Jerk when Fwd, Rev meet $< V_{max}$

(10) loop t from 0 in steps of δt

$\Delta t = 0.02$

For each t find the points

$P_i, P_{i+1} : P_i.t \leq t < P_{i+1}.t$

create array of points with Δt steps

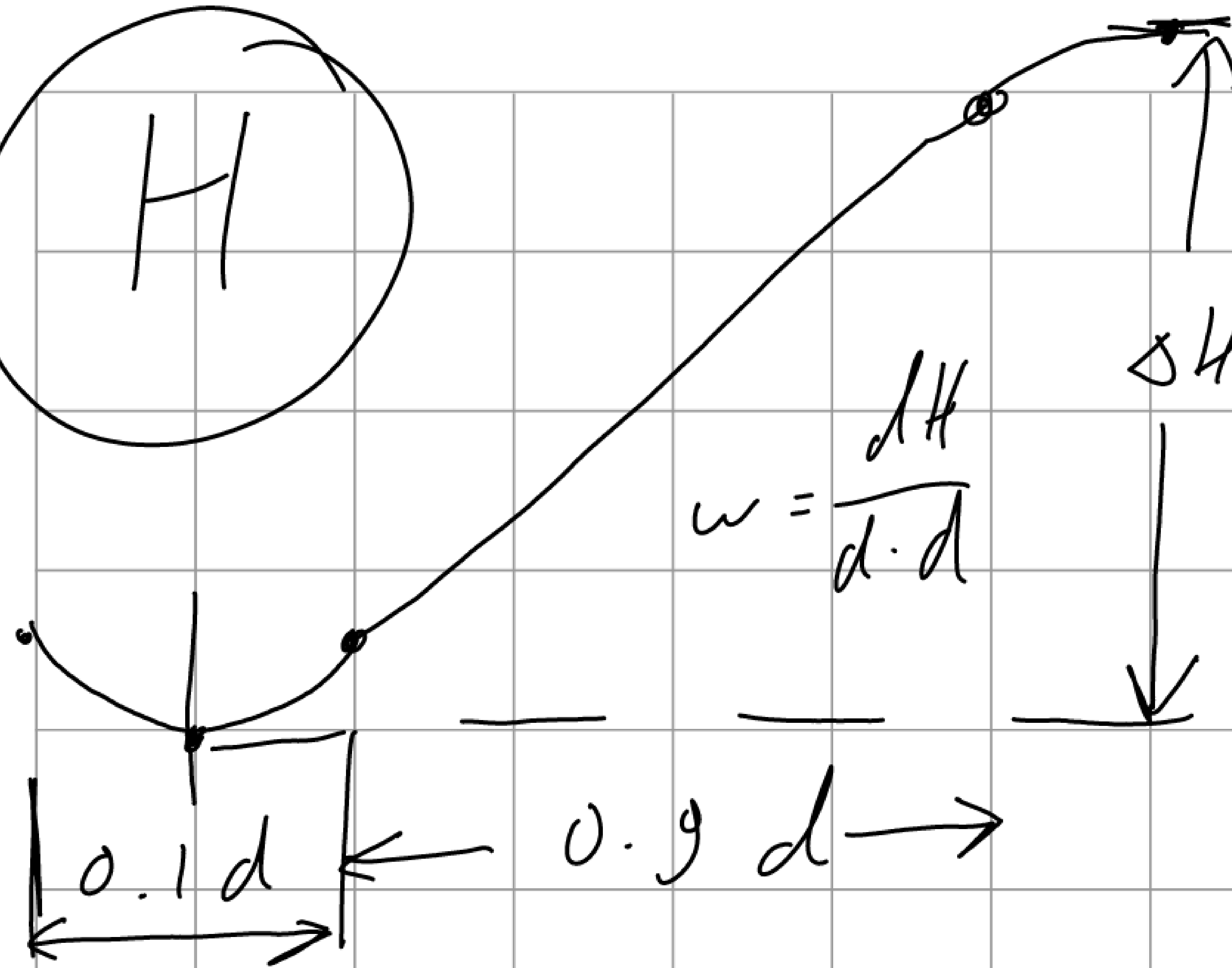
: t, s, x, y, v, H, w

(11) Convert v to (V_x, V_y)

Reverse t ... time to end of section

Return array t, x, y, v_x, v_y, H, w

H



$$H = a x^2 \,, \quad w = 2ax$$

$$x = \overbrace{0.05}^{p} d \,, \quad w(x) = \frac{\Delta H - 2ax^2}{d - 2x} = 2ax$$

$$\Delta H - 2ax^2 = 2ax(d - 2x)$$

$$\Delta H = 2ax(d - x)$$

$$a = \frac{\Delta H}{2x(d-x)} = \frac{\Delta H}{2p(1-p)d^2}$$

$$w = 2a \cdot p \cdot d = \frac{\Delta H}{(1-p)d}$$

$$H = \begin{cases} x < p \cdot d & : a x^2 \\ p \cdot d \le x \le (1-p)d & : a(p \cdot d)^2 + w(x - pd) \\ (1-p)d < x & : \Delta H - a(d-x)^2 \end{cases}$$