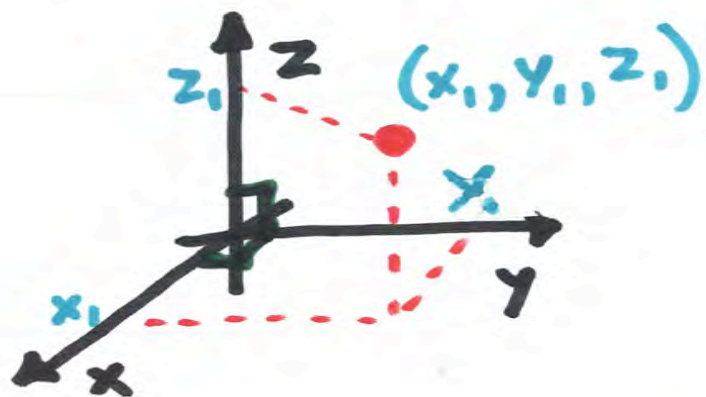
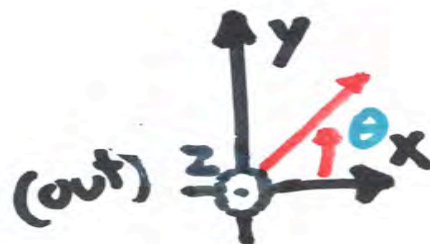
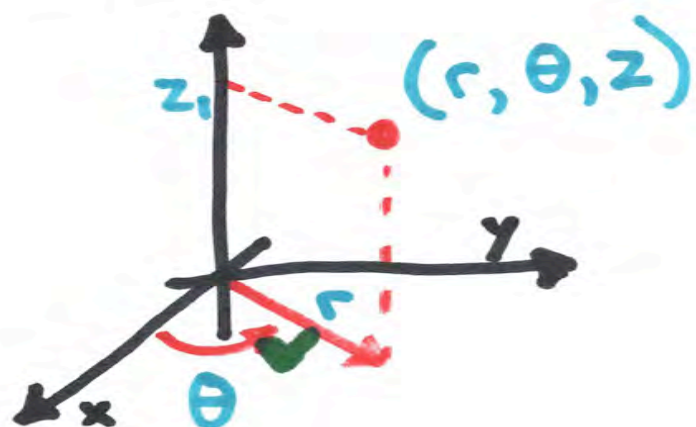


Dimensions



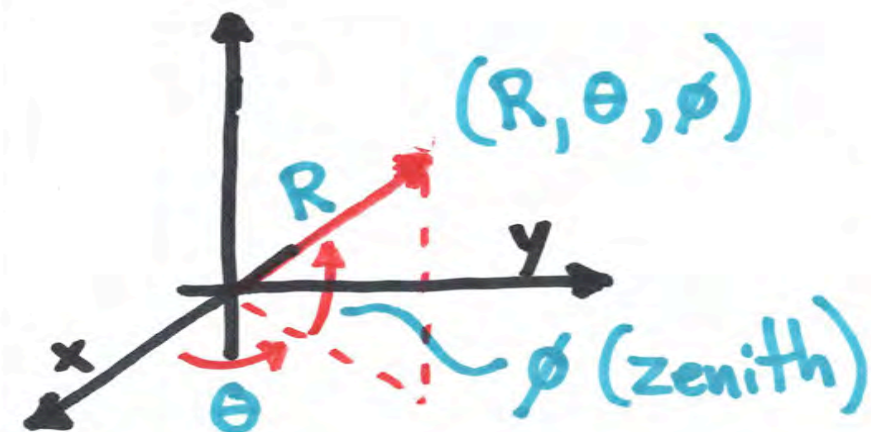
cartesian coordinates



cylindrical
(polar)

coordinates

$\otimes z$
(in to the
page)

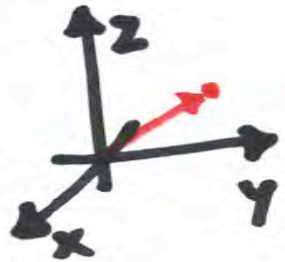


spherical

coordinates



Vector notation



$$\vec{V} = x \hat{x} + y \hat{y} + z \hat{z}$$

vector
unit vectors

type 1

$$\begin{array}{c} \text{x-dir} \\ \underline{V_x = x} \end{array}, \quad \begin{array}{c} \text{y-dir} \\ \underline{V_y = y} \end{array}, \quad \begin{array}{c} \text{z-dir} \\ \underline{V_z = z} \end{array}$$

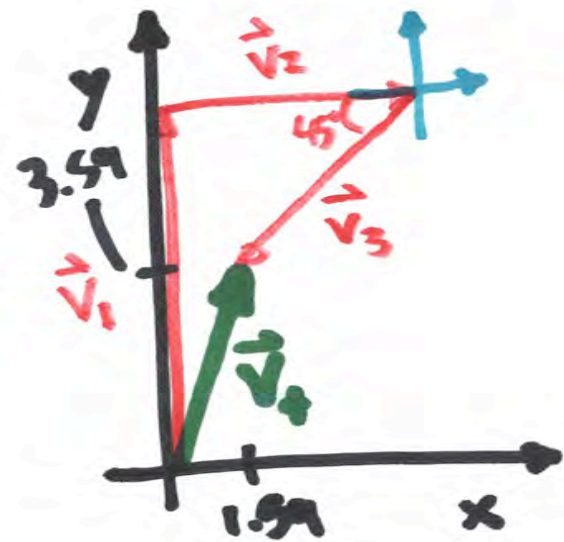
type 2
components
notation



$$\vec{V} = 4 \hat{r} + 60^\circ \hat{\theta} + 3 \hat{z}$$

$$\begin{array}{c} \text{r-dir} \\ \underline{V_r = 4} \end{array}, \quad \begin{array}{c} \text{\theta-dir} \\ \underline{V_\theta = 60^\circ} \end{array}, \quad \begin{array}{c} \text{z-dir} \\ \underline{V_z = 3} \end{array}$$

You walk 5m north, 3m East and 2m 45° South of West, How far are you from where you started?



$$\vec{v}_1 = 0 \hat{x} + 5 \hat{y}$$

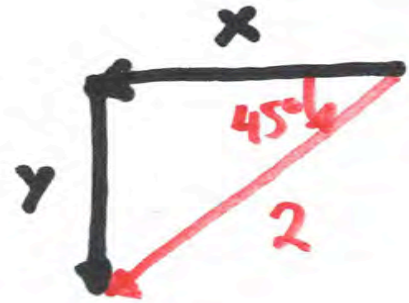
$$\vec{v}_2 = 3 \hat{x} + 0 \hat{y}$$

$$\vec{v}_3 = -1.41 \hat{x} - 1.41 \hat{y}$$

$$\vec{v}_4 = 1.59 \hat{x} + 3.59 \hat{y}$$

$$|\vec{v}_4| = \sqrt{(1.59)^2 + (3.59)^2}$$

$$|\vec{v}_4| = 3.93 \text{ m}$$



$$x = 2 \cos(45^\circ)$$

$$= 1.41$$

$$y = 2 \sin(45^\circ)$$

$$= 1.41$$

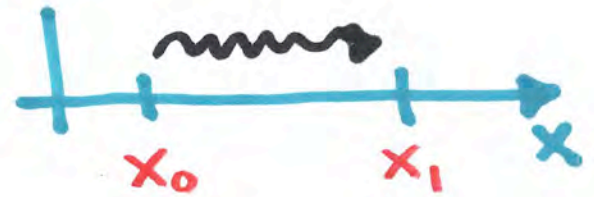
distance - velocity - acceleration equations

distance

what you can measure

x_0 : initial position

x_1 : final position



$$d = x_1 - x_0 = \Delta x$$

sloppy

more precise

Velocity

measure

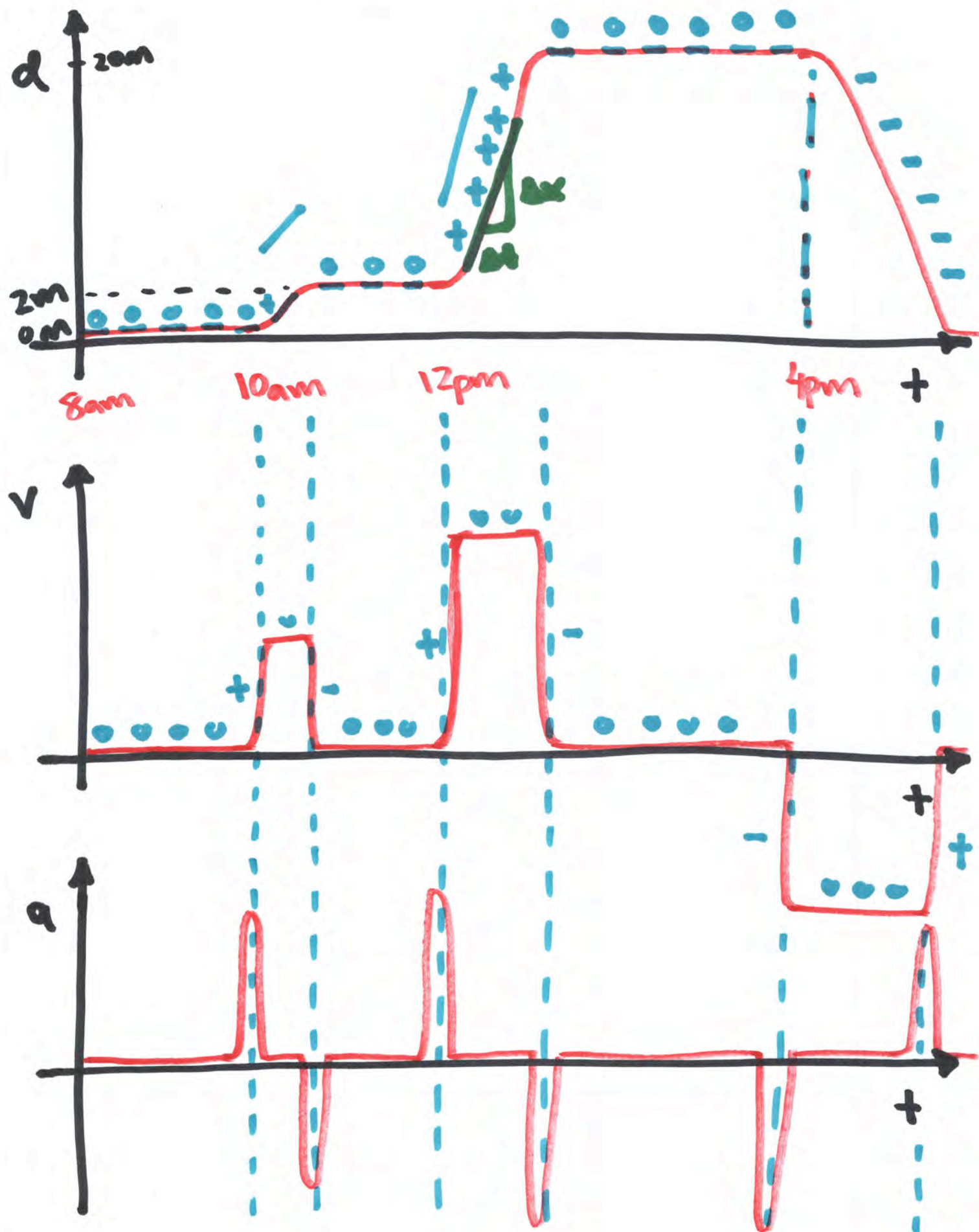
$$V = \frac{\Delta x}{\Delta t} = \frac{\text{rise}}{\text{run}} = \text{slope in the } d-t \text{ graph}$$

time

acceleration

$$a = \frac{\Delta v}{\Delta t} = \text{slope in the } v-t \text{ graph}$$

$d-v-a$ graph



d-v-a continued

distance

velocity

acceleration

jerk

snap

crackle

pop

⋮


$$\frac{\Delta x}{\Delta t}$$


$$\frac{\Delta v}{\Delta t}$$


$$\frac{\Delta a}{\Delta t}$$

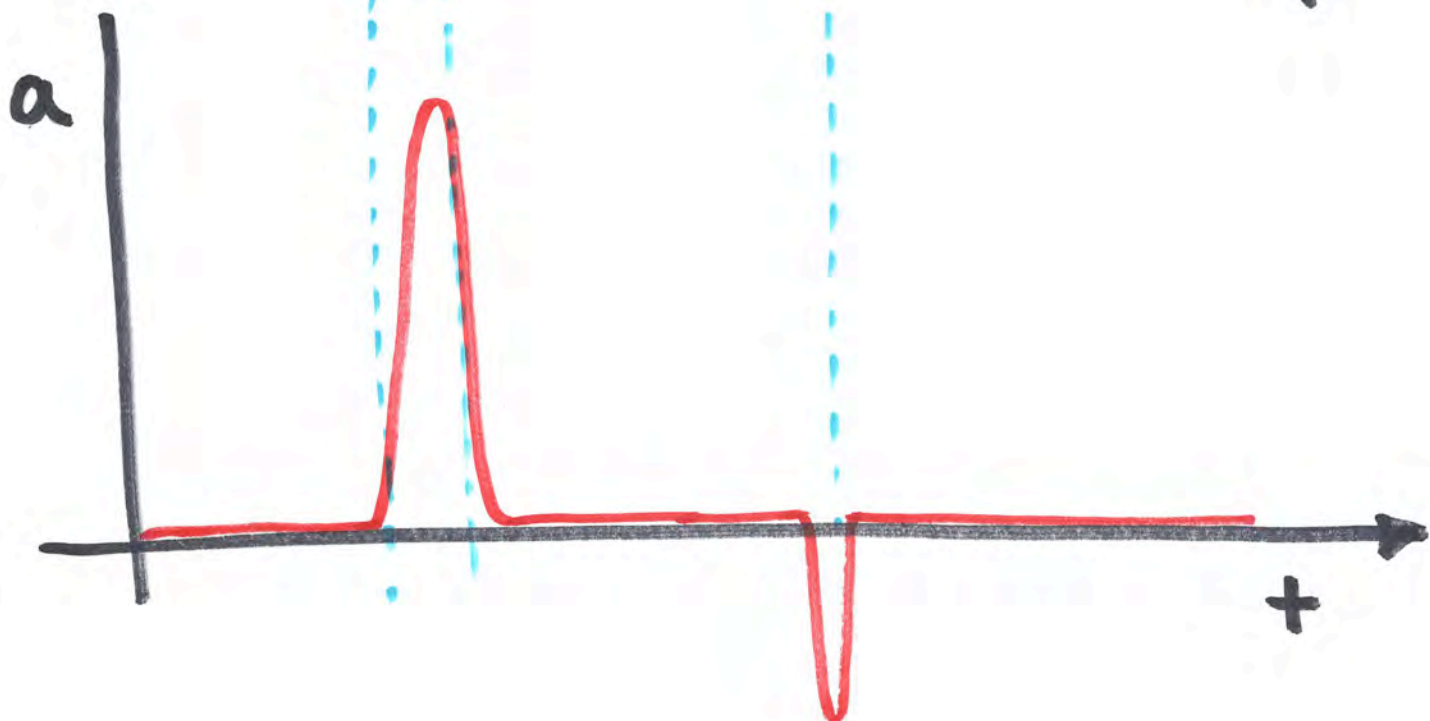
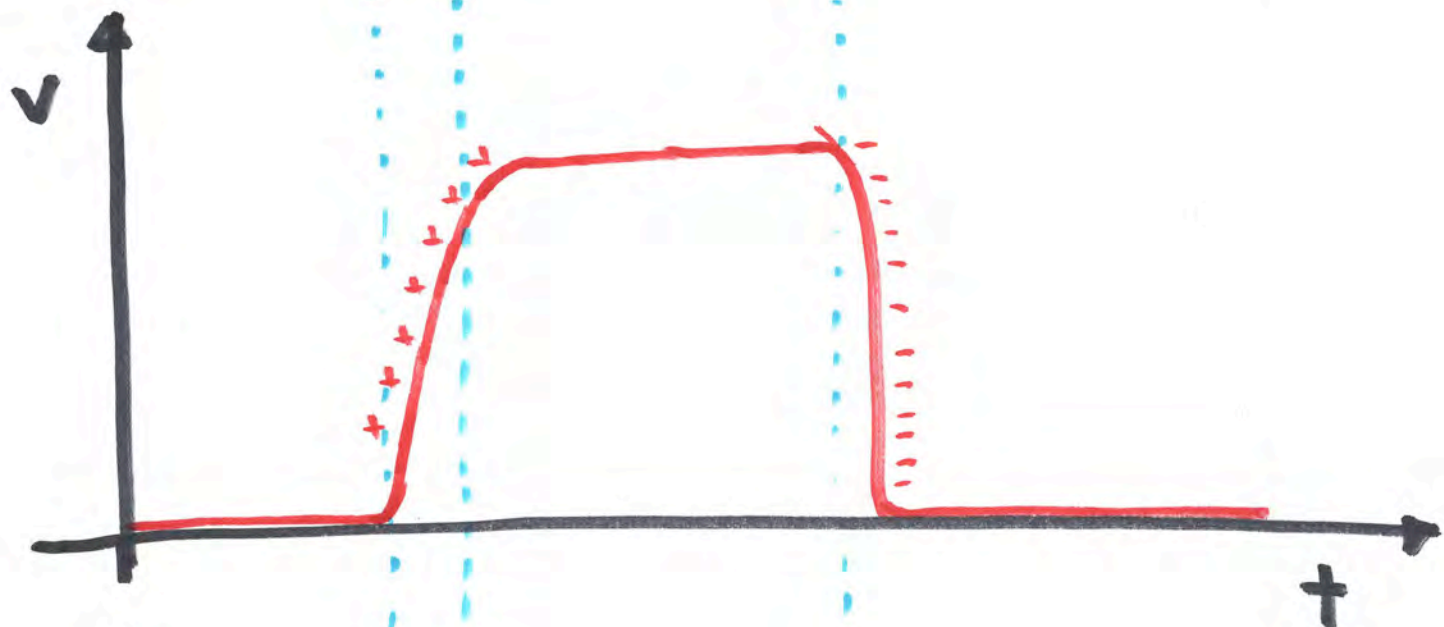
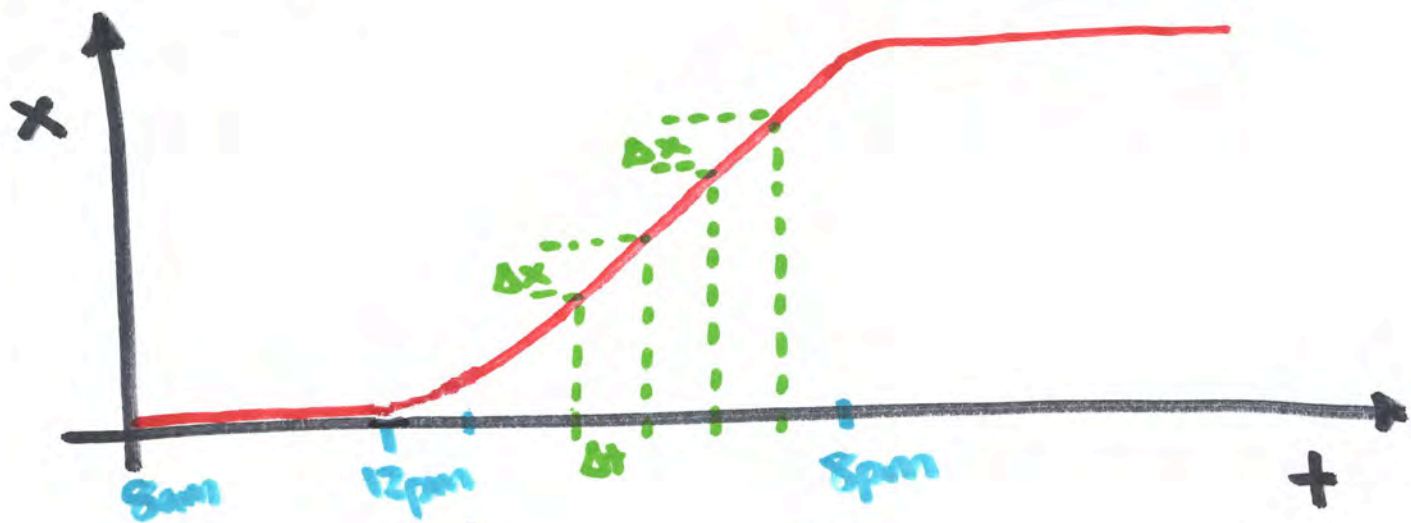


⋮

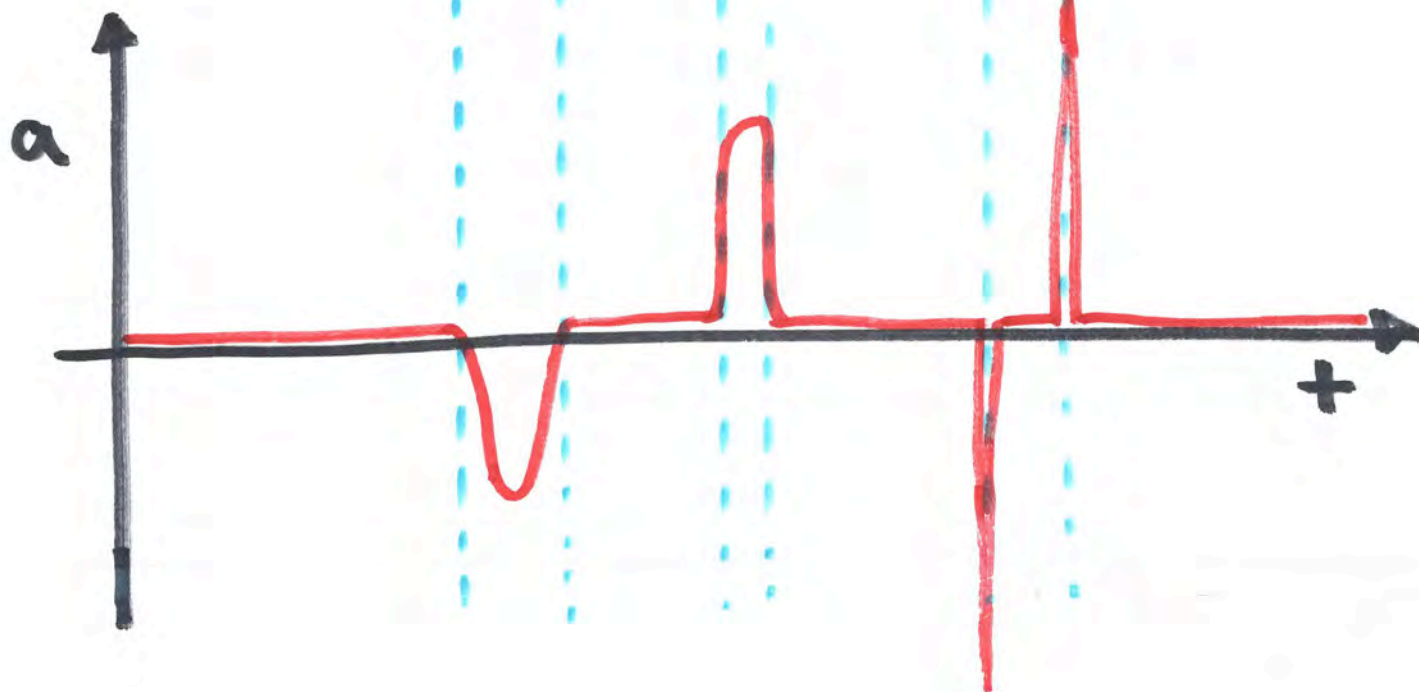
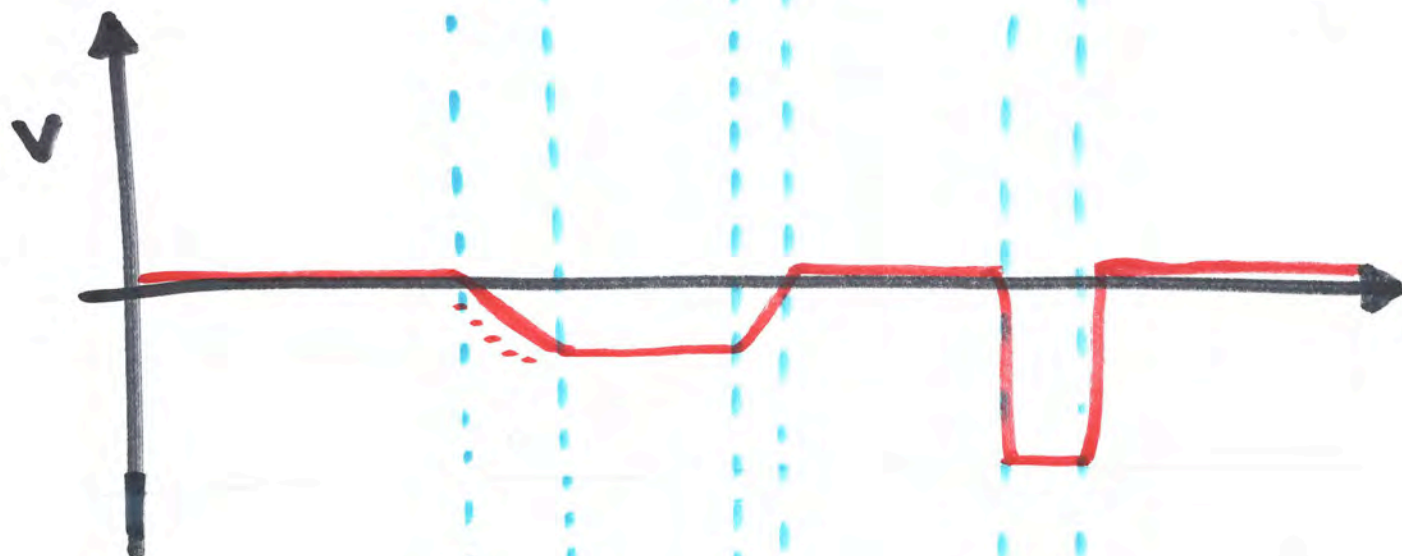
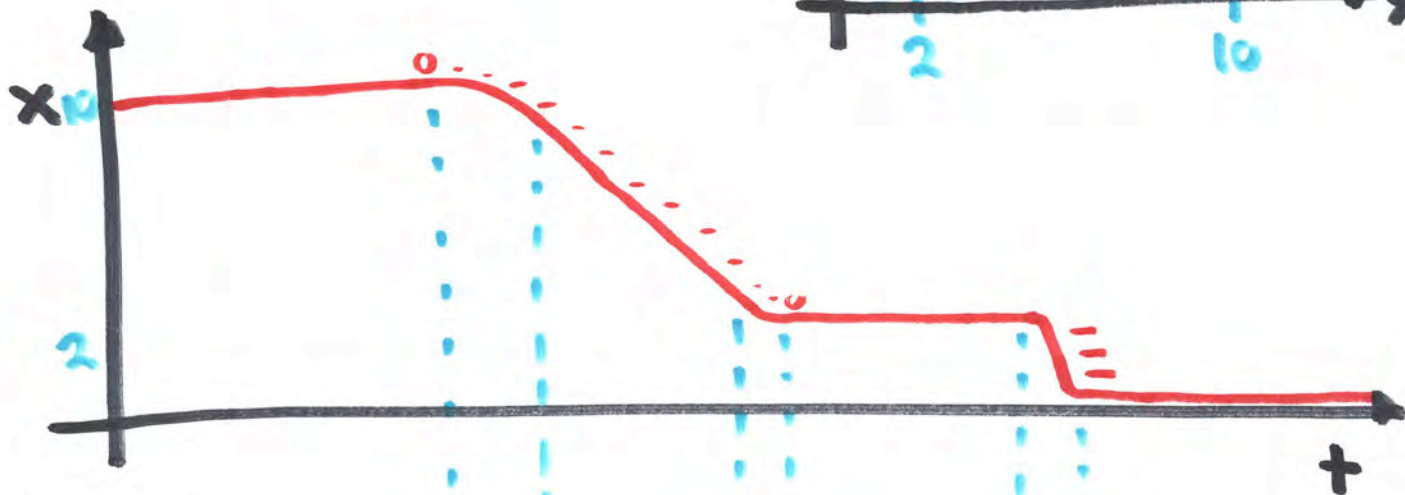


⋮

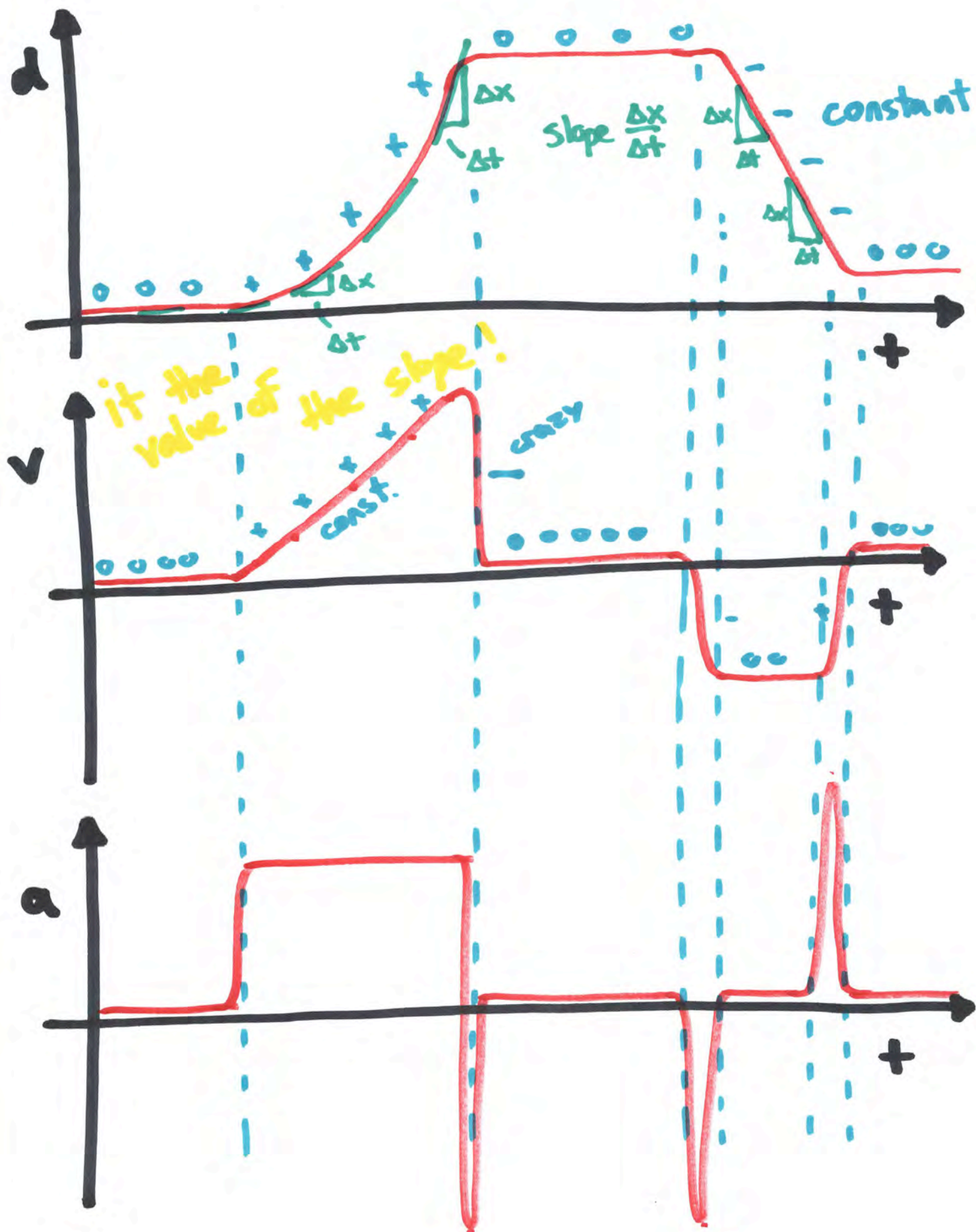
d-v-a graph



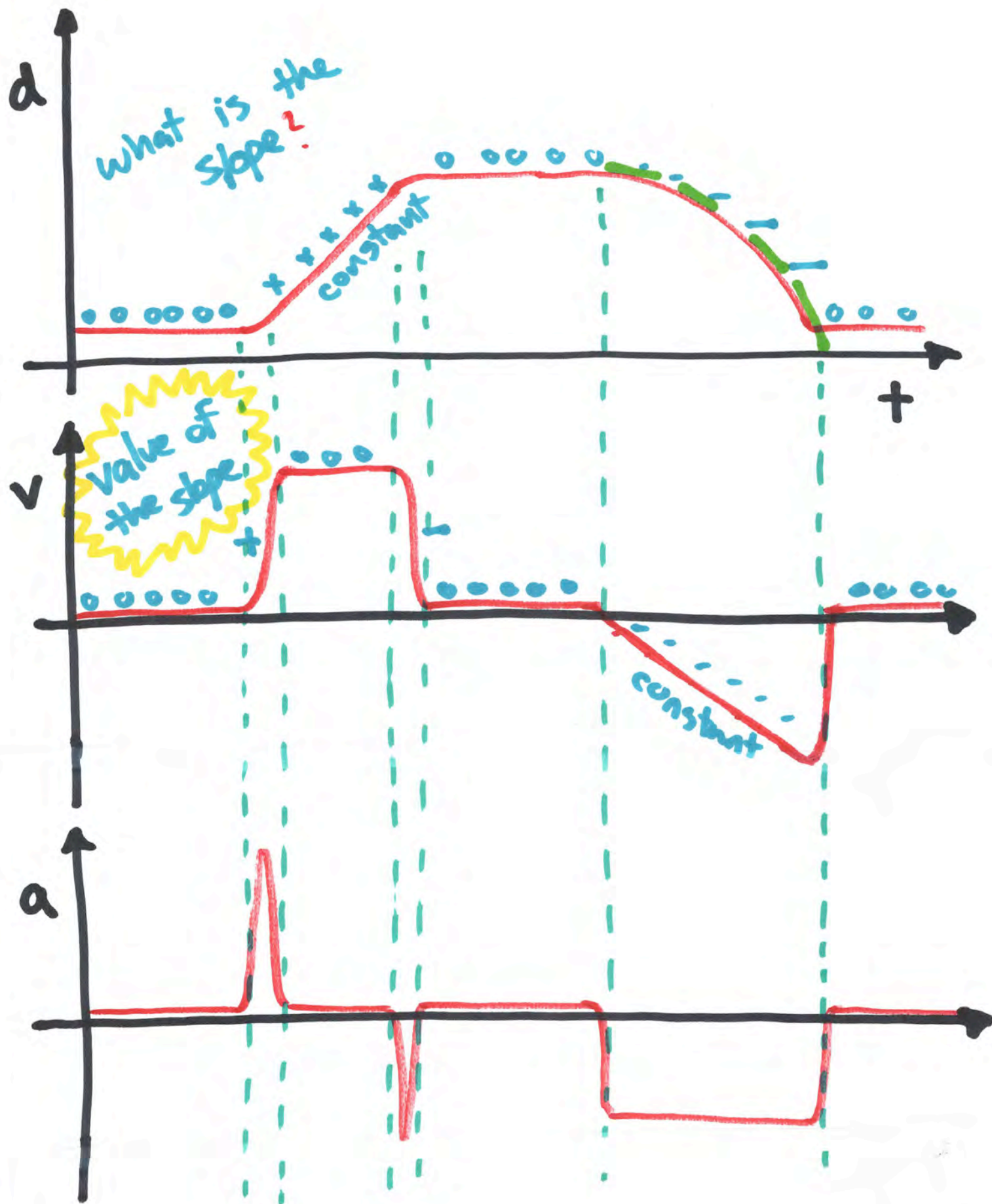
d-v-a graph



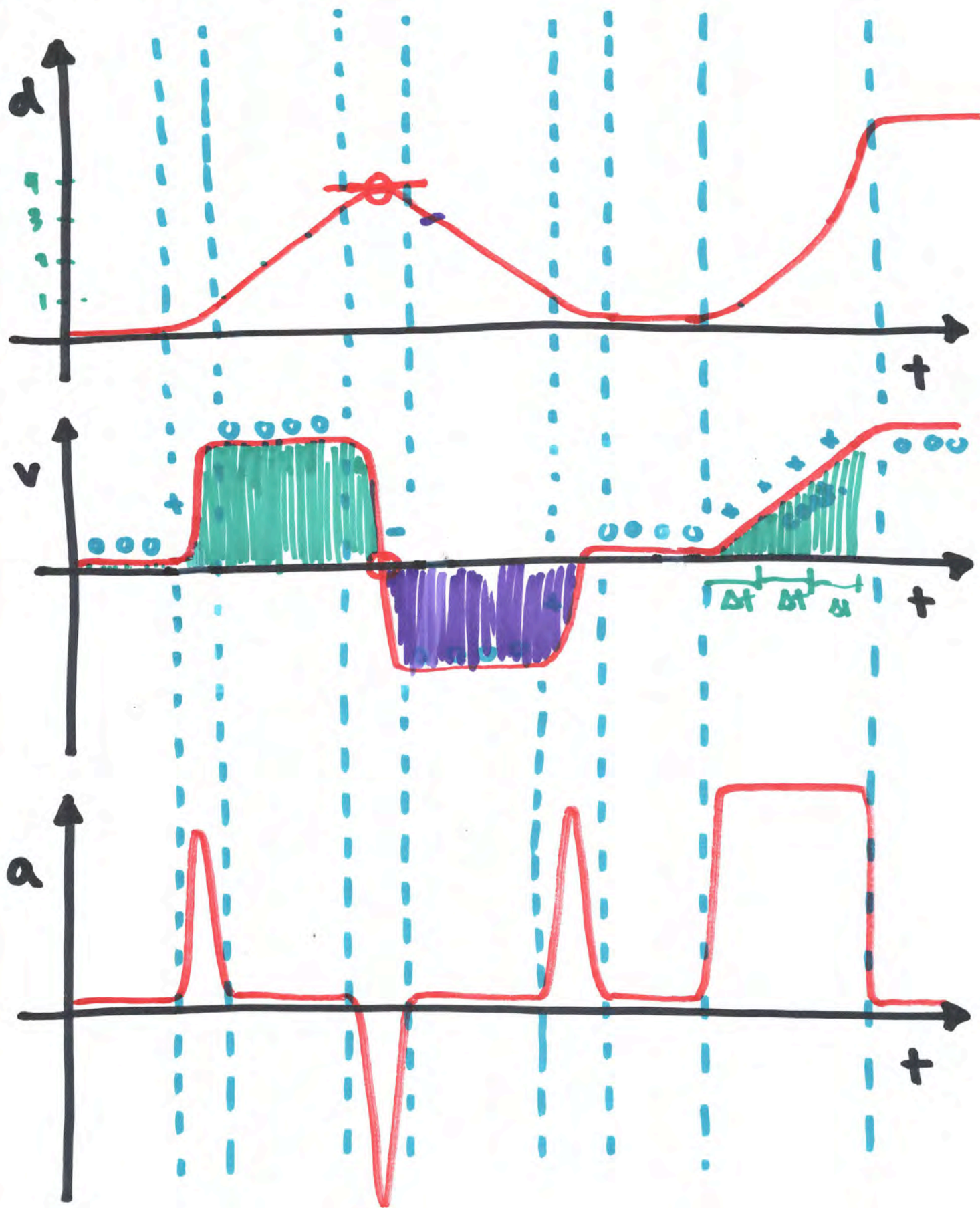
d-v-a graphs



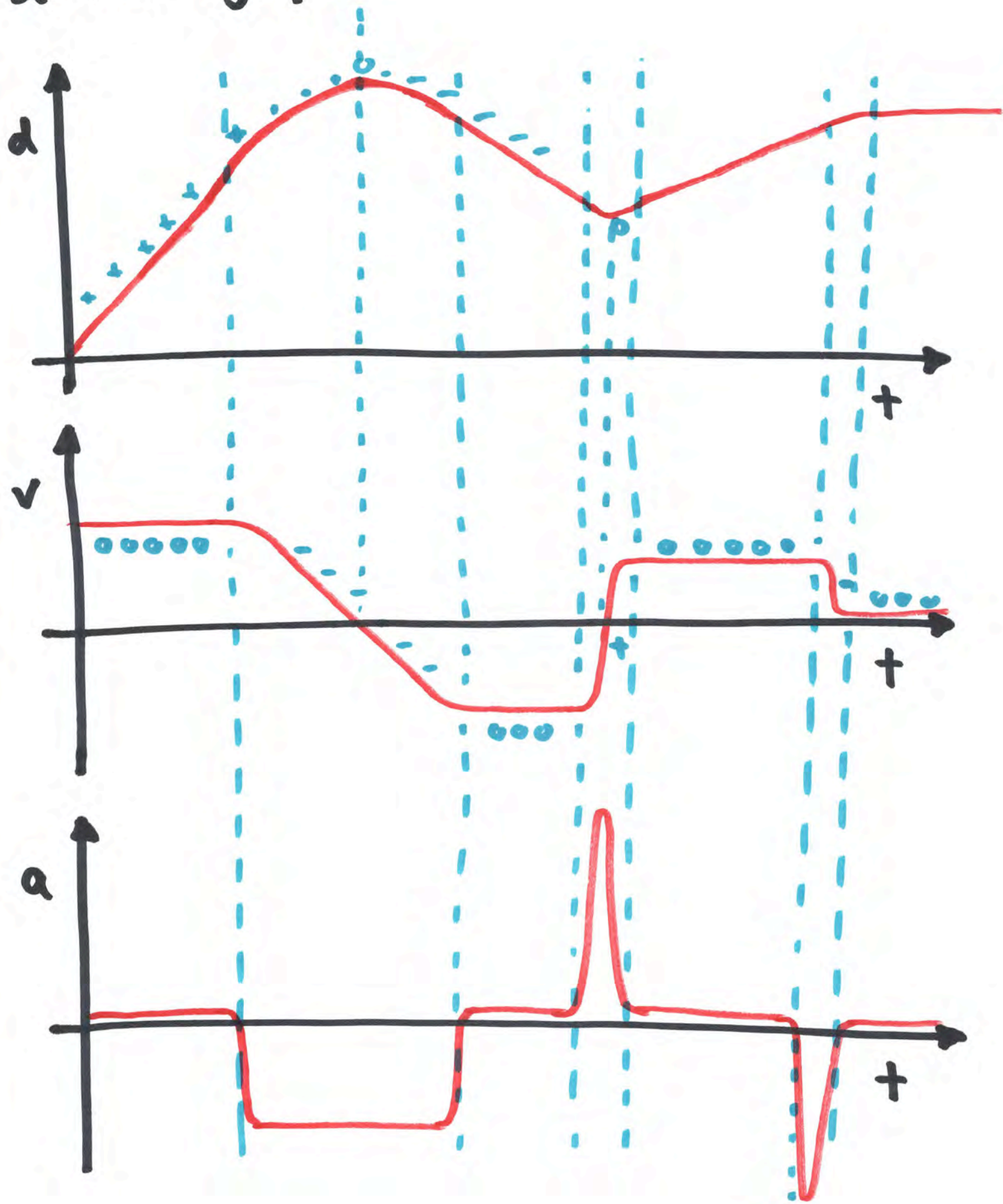
d-v-a graphs



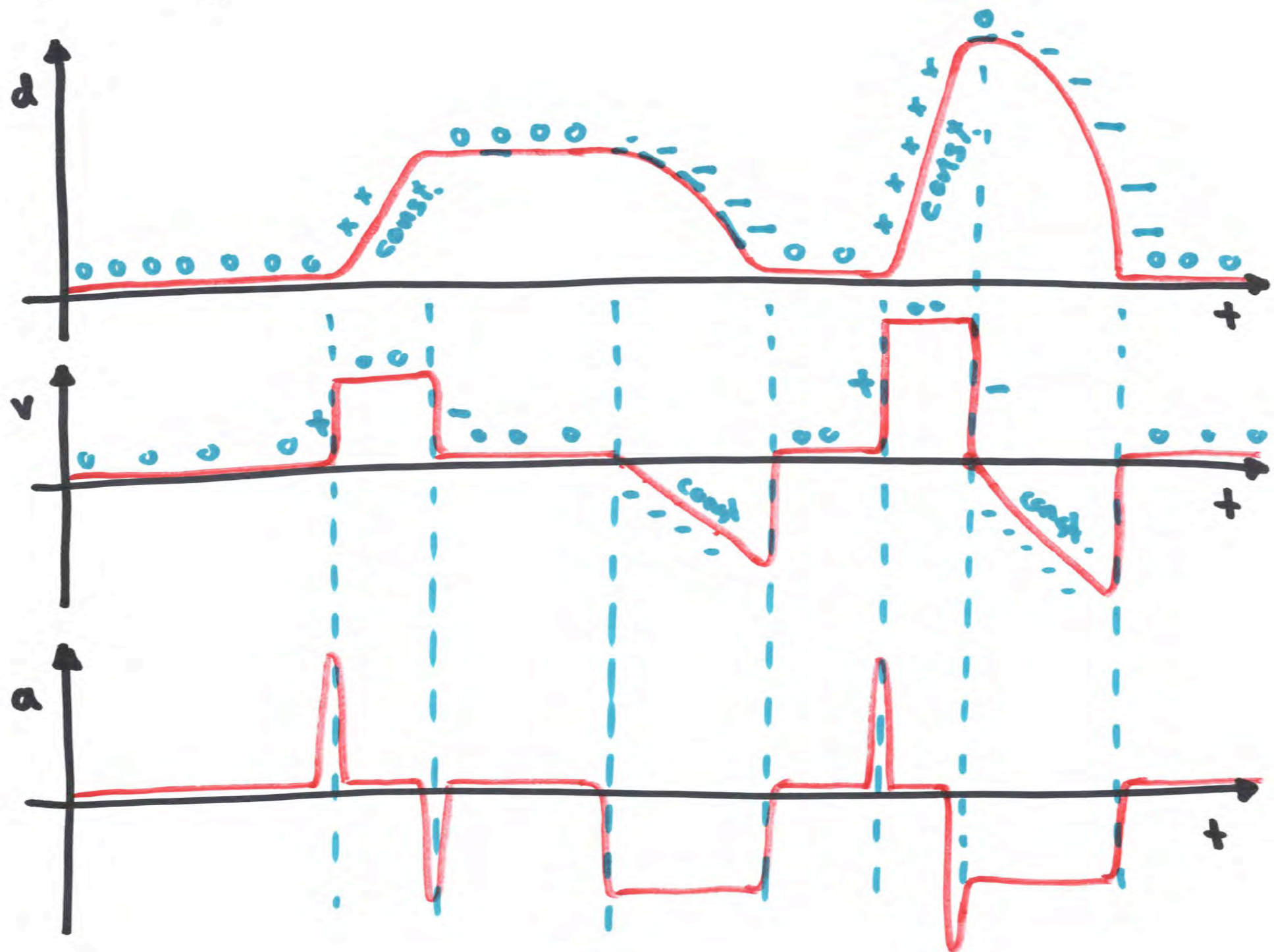
d-v-a graph



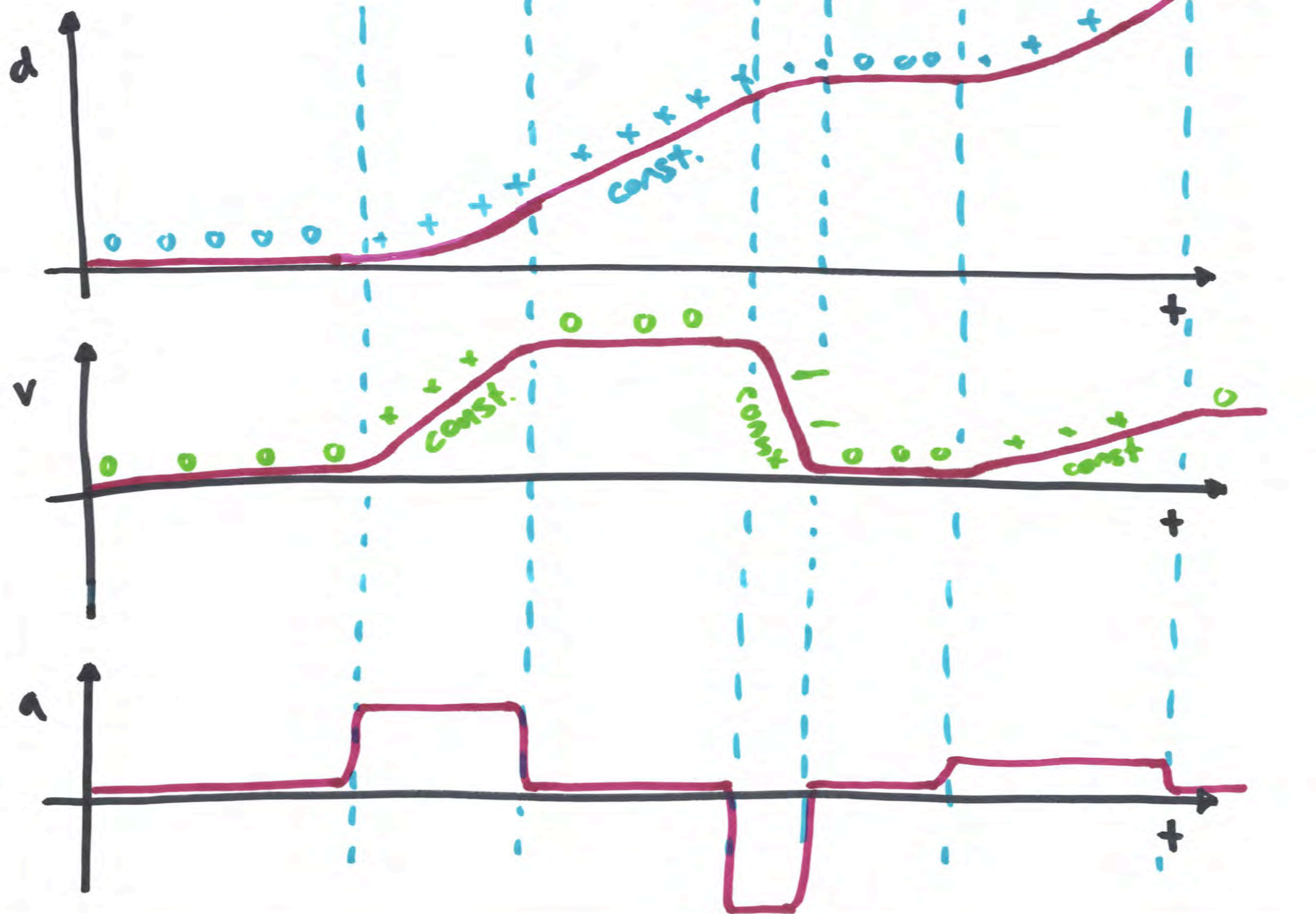
d-v-a graph



d-v-a graph:



d-v-a graphs



d-v-a graphs

