

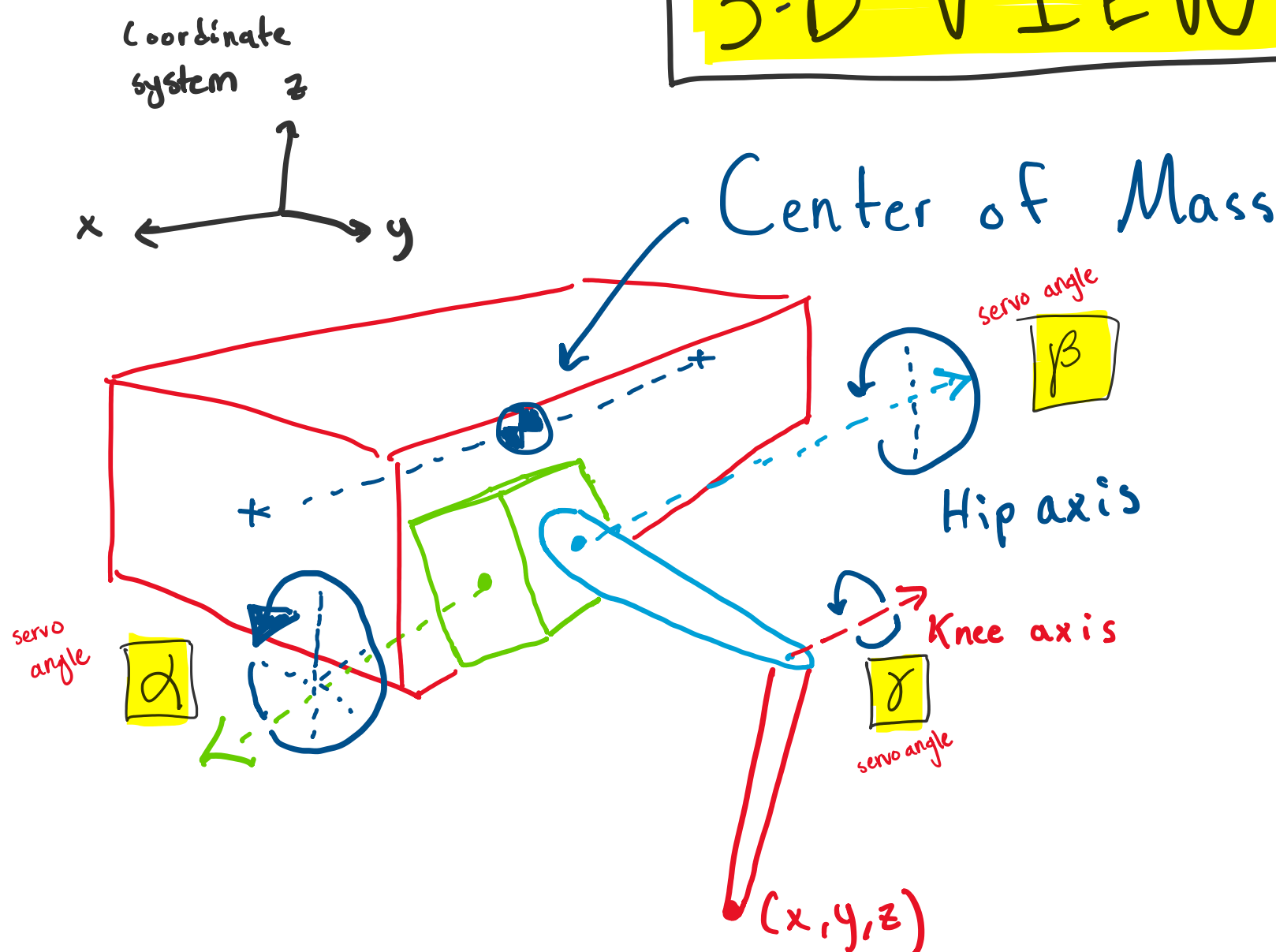
Inverse Kinematics:

Find (α, β, γ) given (x, y, z)

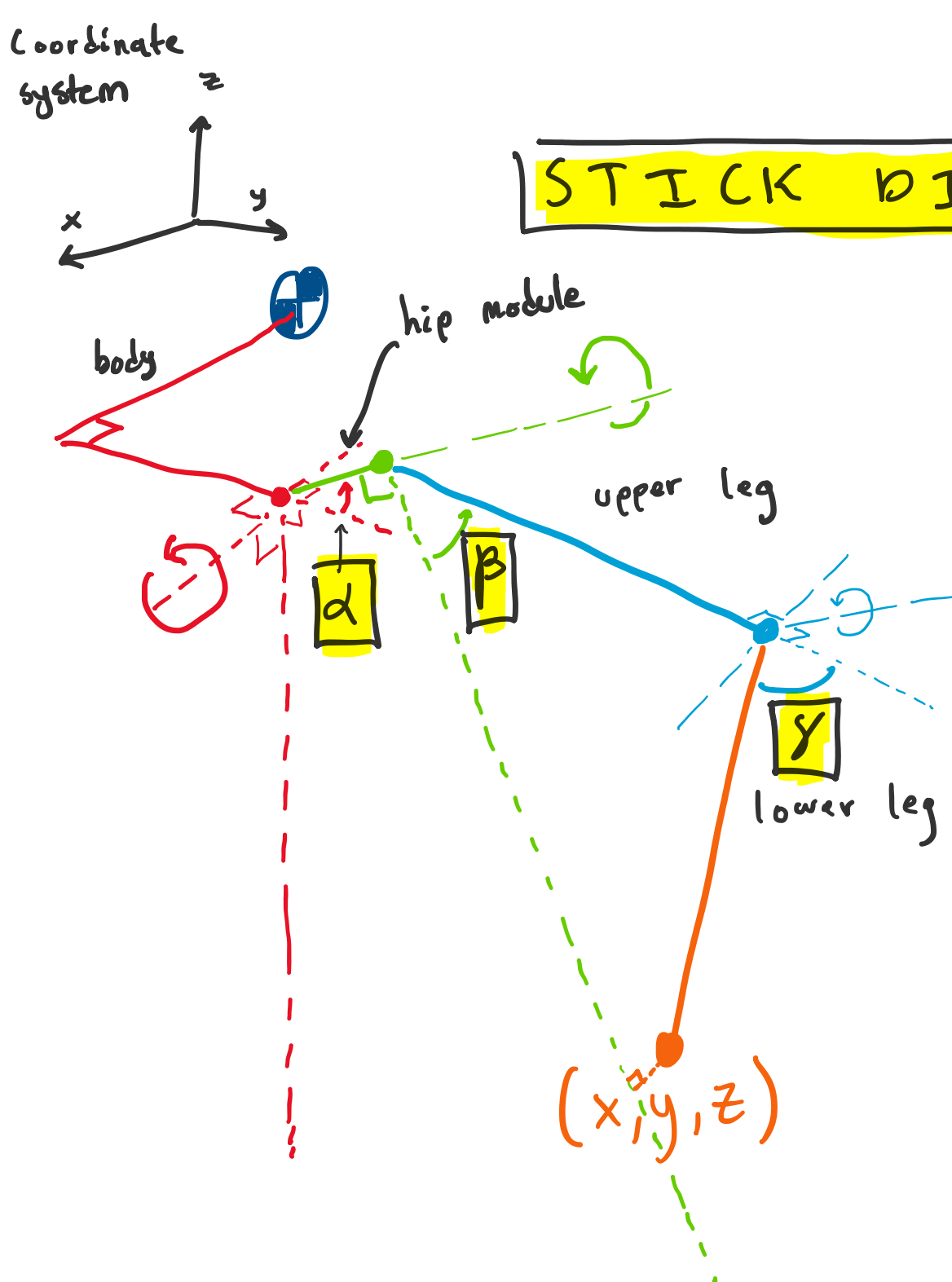
Servo angles

Cartesian coordinates
relative to the body

3-D VIEW

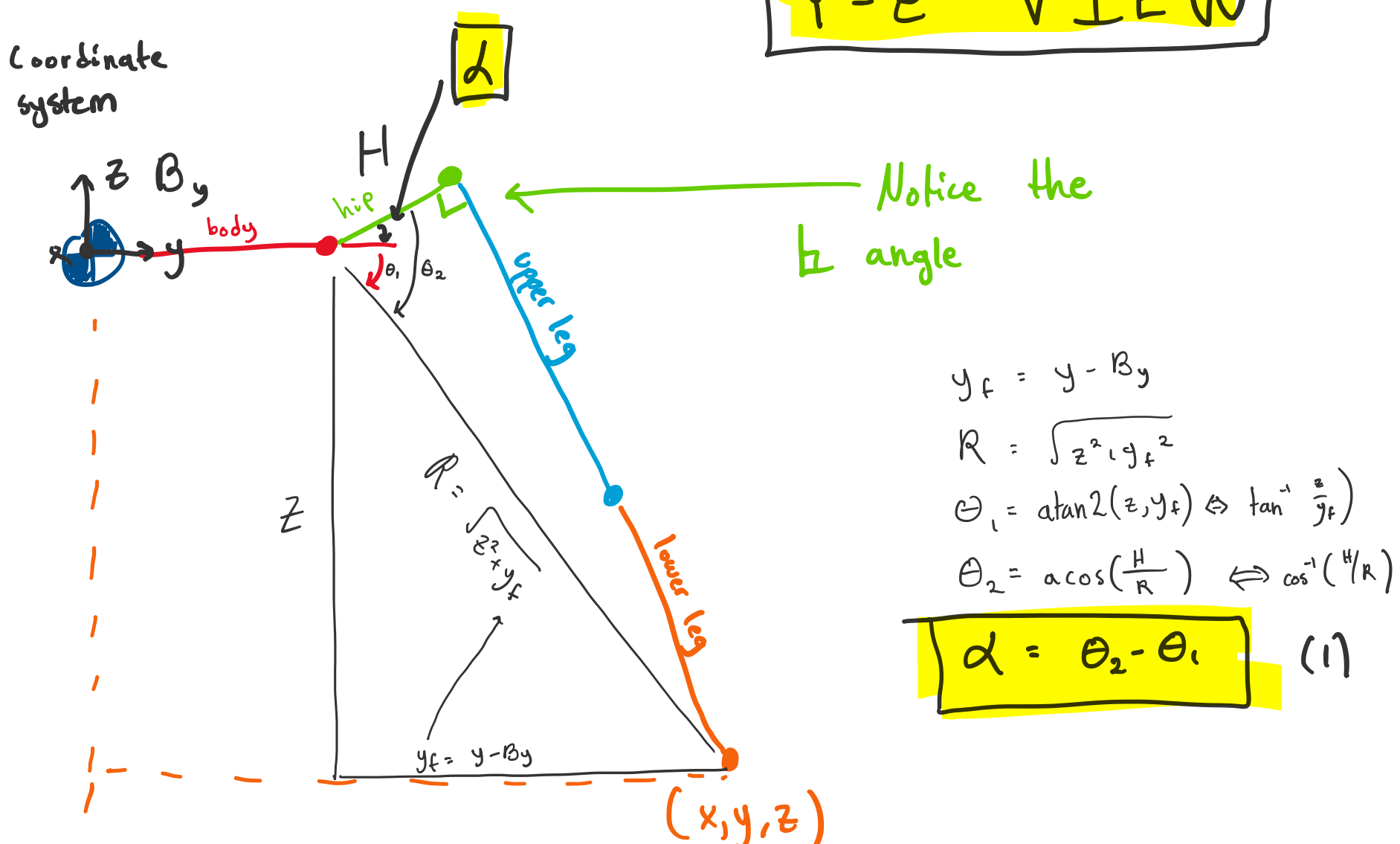


STICK DIAGRAM



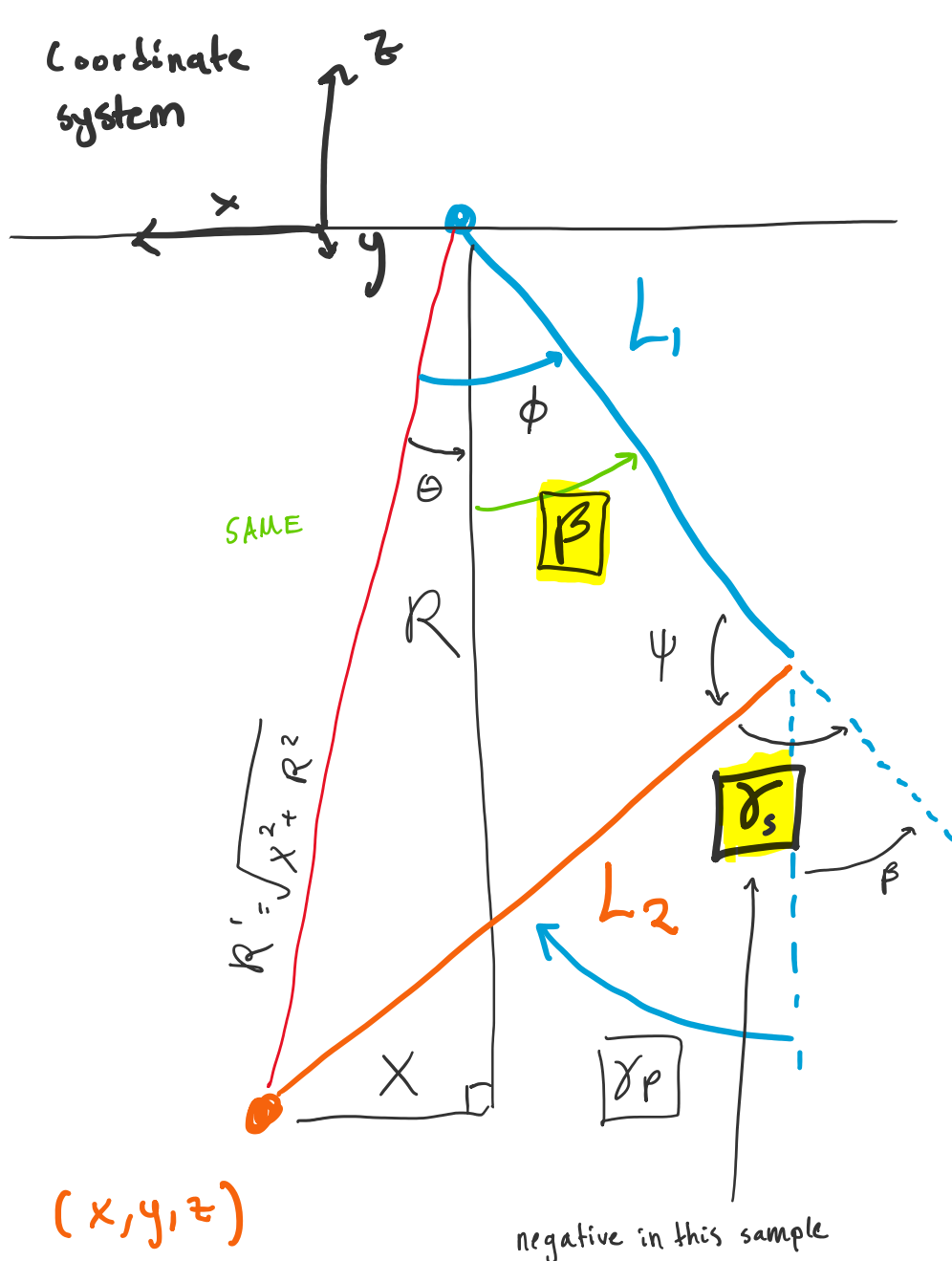
STEP 1

Y-Z VIEW



STEP 2

TILTED X-Z VIEW



$$R' = \sqrt{x^2 + R^2}$$

⊖ sign b/c of
RH rule convention

$$\theta = \arccos\left(\frac{-x}{R'}\right) = \cos^{-1}(-x/R')$$

Law of cosines

$$\phi = \arccos\left(\frac{L_2^2 - L_1^2 - R'^2}{2L_1R'}\right)$$

$$\beta = \phi + \theta$$
 (2)

$$\psi = \arccos\left(\frac{R'^2 - L_1^2 - L_2^2}{2L_1L_2}\right)$$

For serial mechanisms, i.e.,
servo between upper and
lower legs:

$$\gamma_s = \psi - \pi$$

For parallel mechanisms where
a servo connected to the body
controls the lower leg,

$$\gamma_p = \gamma_s + \beta$$