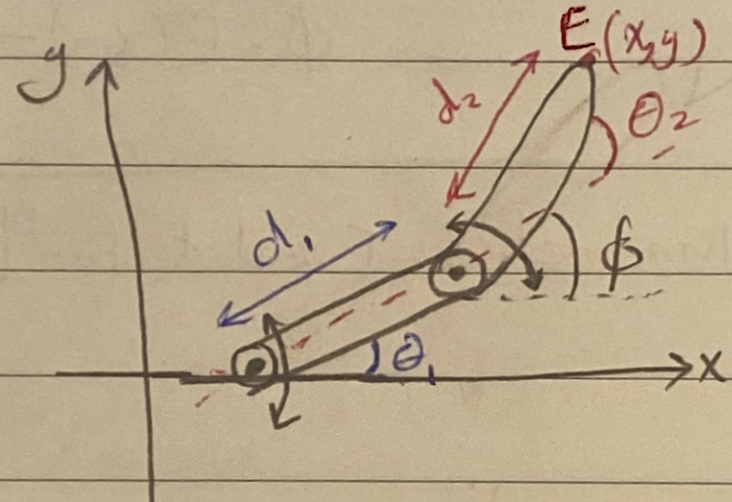
Forward Kinematics ~~Theo~~ degree of freedom (DOF)

↳ Given joint angles ⟶ $\theta_1, \theta_2, d_1, d_2$

↳ We want to find a location of a point in different frame

* What is forward kinematics?

It is a system can be 2D or 3D consist of two rodes with a joint that can move in a specific motion specified by an angle.



NOTE:

θ: Anti clock ⟶ +ve

θ: clockwise ⟶ -ve

Joint Space	World Space
* θ_1, θ_2 ⇒ it represents the coordinates attached to the joints.	* ϕ, E(x,y) ⇒ it represents the absolute coordinates of position of endiffector.
	* ϕ ⟶ represents the overall position of rode "d_2"

Forward kinematics ⇒ It is a system that goes from joint space to world space in order to find the unknowns.

Summery:

Forward / Direct Kinematics:

Joint Space ⟶ World Space

$\theta_1, \theta_2, \theta_3 \rightarrow$ Known ⟶ $\phi, E(x,y) \rightarrow$??

Reverse / Indirect Kinematics:

Joint Space ⟵ World Space

$\theta_1, \theta_2 \rightarrow$?? ⟵ $\phi, E(x,y) \rightarrow$ Known

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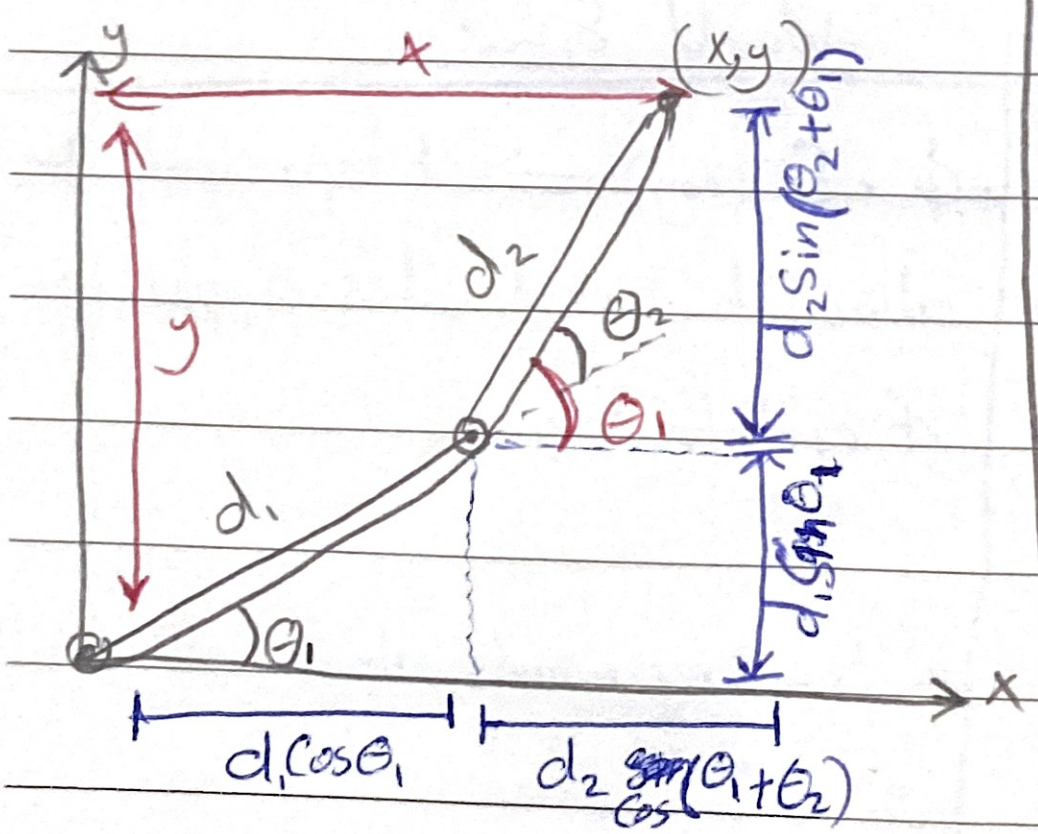
* Two DOF forward kinamedics. I need to find $[x, y, \phi]$:

↳



$x = d_1 \cos\theta_1 + d_2 \cos(\theta_1 + \theta_2)$

$y = d_1 \sin\theta_1 + d_2 \sin(\theta_1 + \theta_2)$

$\boxed{\phi = \theta_1 + \theta_2}$

$\sin\theta$ = روبرو / وتر

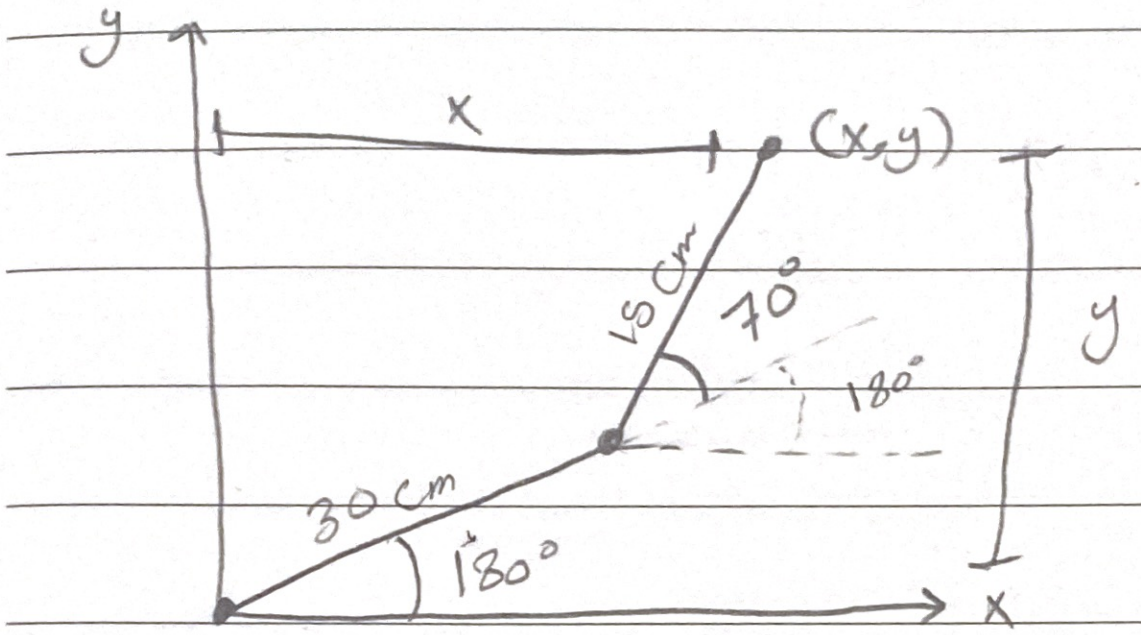
$\cos\theta$ = مجاور / وتر

$\tan\theta$ = روبرو / مجاور

* Calculation of 2 DOF to find ϕ, (x, y): Assuming:

$L_1 = 30cm, L_2 = 15cm, \theta_1 = 180°, \theta_2 = 70°$

① Design:



② Calculation:

↳ Find ϕ:

$\phi = \theta_1 + \theta_2$

$= 180 + 70 = 250°$

↳ Find x:

$x = L_1 \cos\theta_1 + L_2 \cos(\theta_1 + \theta_2)$

$= 30 \cos(180) + 15 \cos(250)$

$= -30 - 5.13$

$= -35.130$ cm

↳ Find y:

$y = L_1 \sin\theta_1 + L_2 \sin(\theta_1 + \theta_2)$

$= 30 \sin(180) + 15 \sin(250)$

$= 0 + (-14.095)$

$= -14.095$ cm