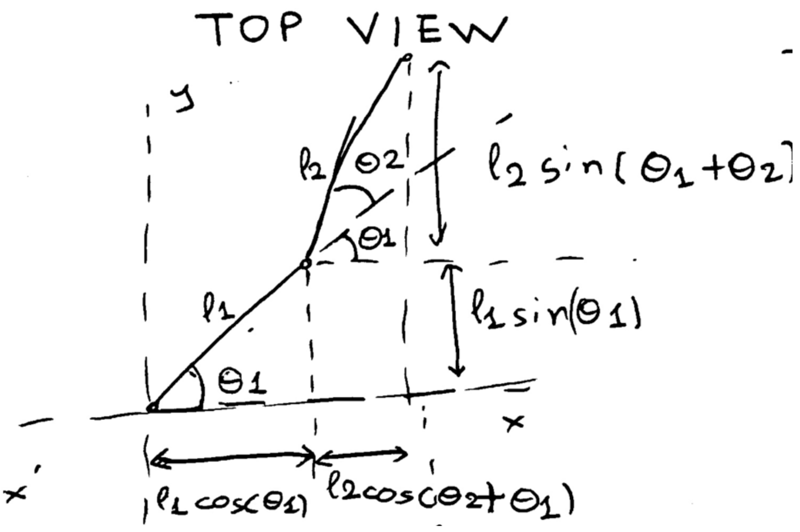
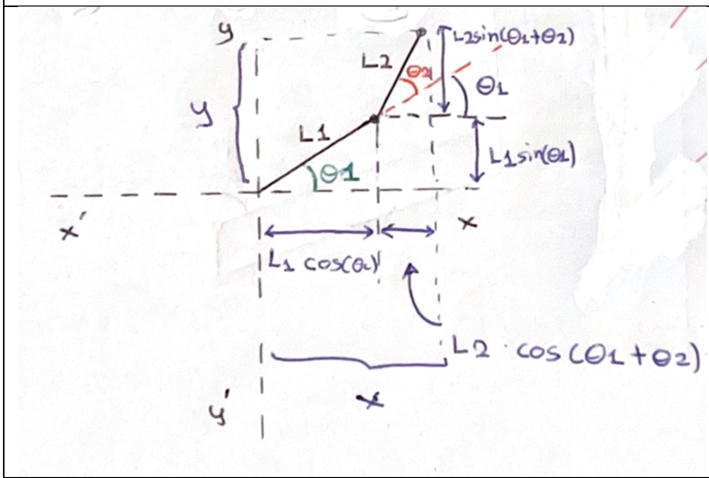
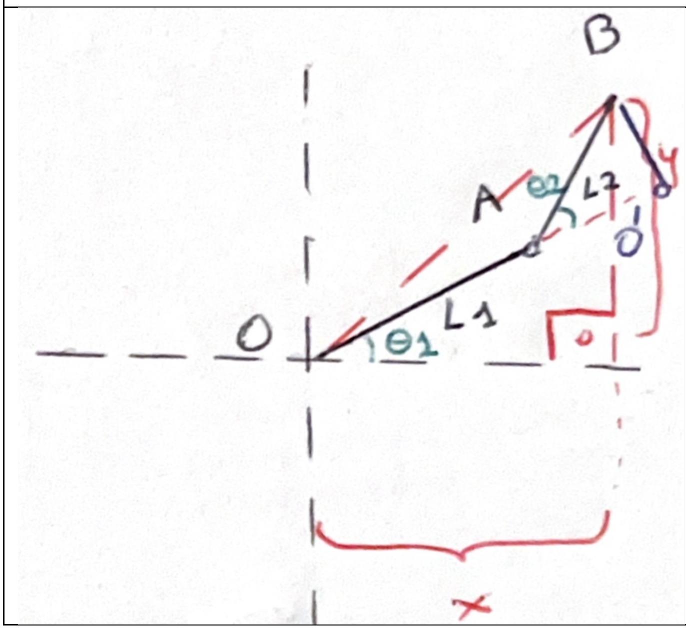


Direct Kinematics	**Analysis**
	We observe that: $x = L1\cos(\theta1) + L2\cos(\theta1 + \theta2)$ $y = L1\sin(\theta1) + L2\sin(\theta1 + \theta2)$ which is the direct kinematics analysis for the robot for its two first articulations We set $\varphi = \theta1 + \theta2$
Inversed Kinematics	**Analysis**
	From Pythagora's theorem: $OB^2 = x^2 + y^2$ Moreover $OB^2 = (L1 + L2\cos(\theta2))^2 + (L2\sin(\theta2))^2 = L2^2\sin(\theta2)^2 + L1^2 + L2^2\cos(\theta2)^2 + 2\,L1\,L2\cos(\theta2)$ $\Leftrightarrow x^2 + y^2 - L1^2 - L2^2(\cos(\theta2)^2 + \sin(\theta2)^2) = 2\,L1\,L2\cos(\theta2)$

So we take:

$$x^2 + y^2 - L1^2 - L2^2 = 2\ L1\ L2\ \cos(\theta 2) \Leftrightarrow \cos(\theta 2) = \frac{x^2 + y^2 - L1^2 - L2^2}{2\ L1\ L2}$$

$$\theta 2 = \arccos(\frac{x^2 + y^2 - L1^2 - L2^2}{2\ L1\ L2})$$

Now for θ1:

$\varphi = \theta 1 + \theta 2 \Leftrightarrow \theta 1 = \varphi - \theta 2$ but what if we don't know ϕ? Well, in that case:

$ABO'triangle$:

$$\sin(\theta 2) = \sqrt{1 - \cos(\theta 2)^2}$$

$\mathrm{BO}Acorner$ of $BOO'triangle$:

$$\mathrm{BO}Acorner = \arctan(\frac{\mathrm{BO'}}{L1 + \mathrm{AO'}}) = \arctan(\frac{L2\sin(\theta 2)}{L1 + L2\cos(\theta 2)})$$

Let's say that $\mathrm{BO}Acorner + \theta 1 = \gamma$ so:

$$\theta 1 = \gamma - \mathrm{BO}Acorner = \arctan(\frac{y}{x}) - \arctan(\frac{L2\sin(\theta 2)}{L1 + L2\cos(\theta 2)})$$