**Task2: calculate forward and inverse kinematics of a robot with 3rd DOF**

Forward kinematics

**Question:**

Given:

* Link lengths: L1​, L2, L3
* Joint angles: θ1​, θ2​, θ3

Unknown:

* The position of the end effector in Cartesian coordinates (x, y, z).

**Answer:**

x = L1 cos(theta\_1) + L2 cos(theta\_1 + theta\_2) + L3 cos(theta\_1 + theta\_2 + theta\_3)

y = L1 sin(theta\_1) + L2 sin(theta\_1 + theta\_2) + L3 sin(theta\_1 + theta\_2 + theta\_3)

z = 0

Inverse kinematics

**Question:**

Given:

* The position of the end effector in Cartesian coordinates: (x,y,z)
* Link lengths: L1​, L2​, L3​

Unknown:

* The joint angles: θ1​, θ2​, θ3​

**Answer:**

thata1= arctan(y/x)

theta2=arccos((r^2-L1^2-L2^2)/(2L1L2))

theta3=ϕ-theta2

where r = sqrt{x^2 + y^2}) and ϕ= arctan(y/x) - arctan ((L2sin(theta2))/ L1+L2 cos(theta2))