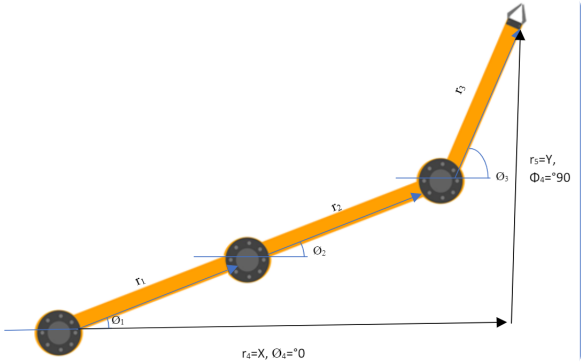
Forward Kinematics :-



$r_1 + r_2 + r_3 = r_4 + r_5$

sin cos sin cos sin cos — sin 0 cos 0 — sin cos 0

Cos :

$X r_4 = r_1 \cos\theta_1 + r_2 \cos\theta_2 + r_3 \cos\theta_3$

Sin :

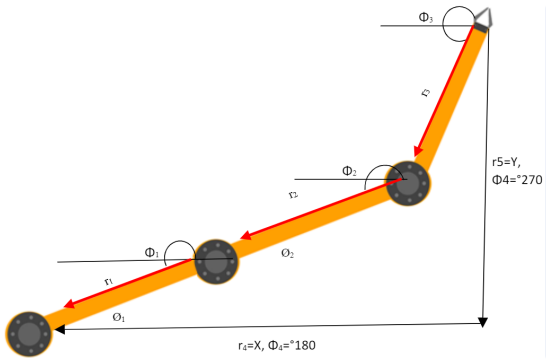
$Y r_5 = r_1 \sin\theta_1 + r_2 \sin\theta_2 + r_3 \sin\theta_3$

Forward Kinematics :

$X = r_1 \cos\theta_1 + r_2 \cos\theta_2 + r_3 \cos\theta_3$

$Y = r_1 \sin\theta_1 + r_2 \sin\theta_2 + r_3 \sin\theta_3$

Inverse Kinematics :-



Inverse :

$r_5 + r_4 = r_3 + r_2 + r_1$

Cos ϕ, $\Phi_4 = 180$, $\Phi_5 = 270$

$-X = r_3 \cos\Phi_3 + r_2 \cos\Phi_2 + r_1 \cos\Phi_1$

Sin Φ, $\Phi_1 = \Phi_1 + 180$, $\Phi_2 = \Theta_2 + 180$, $\Phi_3 = \Theta_3 + 180$

$-Y = r_3 \sin\Phi_3 + r_2 \sin\Phi_2 + r_1 \sin\Phi_1$

$\Phi_2 = \cos^{-1}\left[\frac{-X - r_3\cos\Phi_3 - r_1\cos\Phi_1}{r_2}\right]$

∴ Substitute in sin Φ eq