$$ay = L1 \sin(\Theta_1), by = L2 \sin(\Theta_1 + \Theta_1)$$

=) $2 = ax + bx = L1 \cos(\Theta_1) + L2 \cos(\Theta_1 + \Theta_1)$
= $y = ay + by = L1 \sin(\Theta_1) + L2 \sin(\Theta_1 + \Theta_2)$

an = 11 (05(01), bu=12 (05(01+0)

=)
$$x^2 = L_1^2 (os^2(\Theta_1) + L_2^2 (os^2(\Theta_1 + \Theta_2))$$

+2 $L_1 L_2 (os(\Theta_1) (os(\Theta_1 + \Theta_2))$

We have:
$$\cos a \cos b = \frac{1}{2} \left[\cos(a+b) + \cos(a-b) \right]$$

 $\gamma_1^2 = L_1^2 \left[\cos^2(\Theta_1) + L_2^2 \left(\cos^2(\Theta_1 + \Theta_2) \right) + 2 L_1 L_2 \left[\frac{1}{2} \left[\cos(2\Theta_1 + \Theta_2) + \cos(\Theta_2) \right] \right]$

$$\frac{\sin(a) \, \sin(b) = \frac{1}{2} \left[\cos(a - b) - \cos(a + b) \right]}{2} \\
\frac{3 = L^{2} \, \sin^{2}(\theta_{1}) + L^{2} \, \sin^{2}(\theta_{1} + \theta_{2})}{2} \\
+ 2L_{1}L_{2} \left[\frac{1}{2} \left[\cos(\theta_{2}) - \cos(2\theta_{1} + \theta_{2}) \right] \right]$$

$$\dot{y} = L_{1}^{2} \sin^{2}(\Theta_{1}) + L_{2}^{2} \sin^{2}(\Theta_{1} + \Theta_{2})
+ L_{1}L_{2} \left[\cos(\Theta_{2}) - (\cos(2\Theta_{1} + \Theta_{2})) \right]
=) \lambda^{2} + \dot{y} = L_{1}^{2} (\cos(\Theta_{3}) + L_{1}^{2} \sin^{2}(\Theta_{2}) + L_{2}^{2} \cos^{2}(\Theta_{1} + \Theta_{2}))$$

+ L2 5in (0,+02)+L1 L2 [(0)(0,)+(0)(20,+02)] +L1 L2 [(0)(02)-(0)(201+02)]

$$+L_{2}^{2}\left((os^{2}(\Theta_{1}+\Theta_{2})+Sih^{2}(\Theta_{1}+\Theta_{2})\right)$$

$$+L_{1}L_{2}\left[(os(\Theta_{2})+(os(2\Theta_{1}+\Theta_{2})+(os(\Theta_{2})-(os(\Theta_{2})-(os(\Theta_{2}))+(o$$

22+43= L7 ((05°(0,)+5in2(01))

Now Oz is knowh

$$\Theta_{3} = 180 - \Theta_{2}$$

$$\Theta_{3} = 180 - \Theta_{2}$$
by cosine law in \triangle BoA
$$L_{2}^{2} = (n^{2} + y^{2}) + L_{1}^{2} - 2L_{1}(\sqrt{x^{2} + y^{2}}) \cos(\Theta_{3})$$

$$= (05(\Theta_{3}) = \frac{x^{2} + y^{2} + L_{1}^{2} - L_{2}^{2}}{2L_{1}(\sqrt{x^{2} + y^{2}})}$$

$$\begin{array}{l}
\log \cos ine \ |an \ |h \ \Delta \ BoA \\
L_{2} = (n^{2} + y^{2}) + L_{1} - 2 L_{1}(\sqrt{x^{2} + y^{2}}) \cos(e^{2} + y^{2}) + L_{1} - 2 L_{1}(\sqrt{x^{2} + y^{2}}) \cos(e^{2} + y^{2} + L_{1} - L_{2}) \\
=) \cos(\Theta_{4}) = \frac{x^{2} + y^{2} + L_{1} - L_{2}}{2 L_{1}(\sqrt{x^{2} + y^{2}})} \\
\Theta_{4} = \cos(\frac{x^{2} + y^{2} + L_{1} - L_{2}}{2 L_{1}(\sqrt{x^{2} + y^{2}})})$$

in DOBA we have:

$$(05(01+04)=\frac{x}{\sqrt{x^2+y^2}}$$

$$=) \theta_1 + \theta_4 = (-5)^{1} \left(\frac{\chi}{\sqrt{\chi^2 + y^2}} \right)$$

=)
$$\Theta_1 = (os^{-1}(\frac{x}{\sqrt{x^2+y^2}}) - \Theta_4$$

=) $\Theta_1 = (os^{-1}(\frac{x}{\sqrt{x^2+y^2}}) - cos^{-1}(\frac{x^2+y^2+L_2^2-L_2^2}{2L_1(\sqrt{x^2+y^2}})$