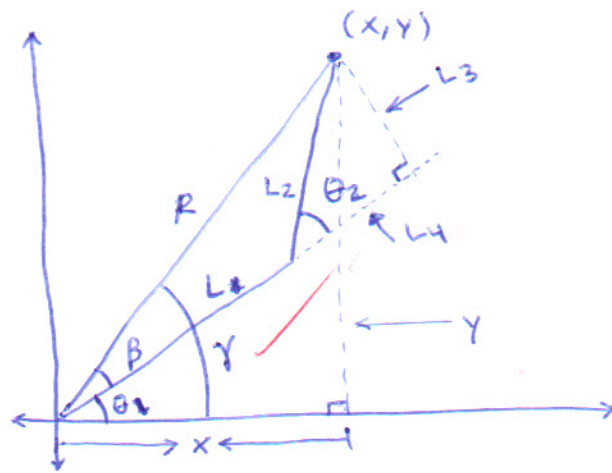


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Homework 1.

1) Find θ_1

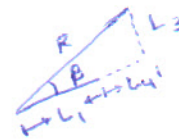


- Let's assume that $\gamma = \beta + \theta_1$

$$\Rightarrow \theta_1 = \gamma - \beta \quad \text{--- (1)}$$

$$\textcircled{3} \quad \tan(\gamma) = \frac{y}{x} \quad \text{--- (2)}$$

$$\text{---} \quad \tan(\beta) = \frac{L_3}{L_1 + L_4} \quad \text{--- (3)}$$



$$\text{but } \sin(\theta_2) = \frac{L_3}{L_2}$$

$$\Rightarrow L_3 = L_2 \sin(\theta_2) \quad \text{--- (3a)}$$



$$\text{and } \cos(\theta_2) = \frac{L_4}{L_2}$$

$$\Rightarrow L_4 = L_2 \cos(\theta_2) \quad \text{--- (3b)}$$

using (3a) and (3b) in (3)

$$\Rightarrow \tan(\beta) = \frac{L_2 \sin(\theta_2)}{L_1 + (L_2 \cos(\theta_2))} \quad \textcircled{3}$$

$$\Rightarrow \beta = \tan^{-1} \left(\frac{L_2 \sin(\theta_2)}{L_1 + L_2 \cos(\theta_2)} \right) \quad \text{--- (4)}$$

$$\text{--- from (2)} \Rightarrow \gamma = \tan^{-1} \left(\frac{y}{x} \right) \quad \text{--- (5)} \quad \textcircled{2}$$

- using (4) and (5) in (1)

$$\Rightarrow \theta_1 = \tan^{-1} \left(\frac{y}{x} \right) - \tan^{-1} \left(\frac{L_2 \sin(\theta_2)}{L_1 + L_2 \cos(\theta_2)} \right) \quad \textcircled{2}$$