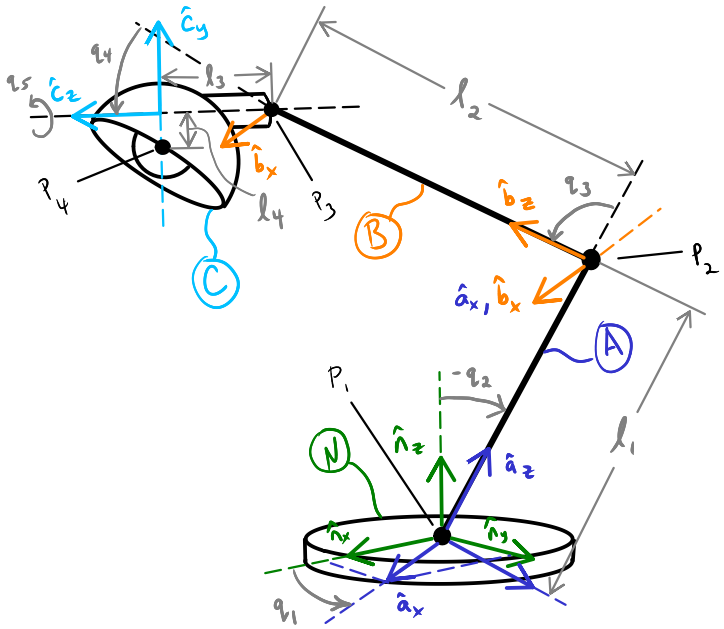
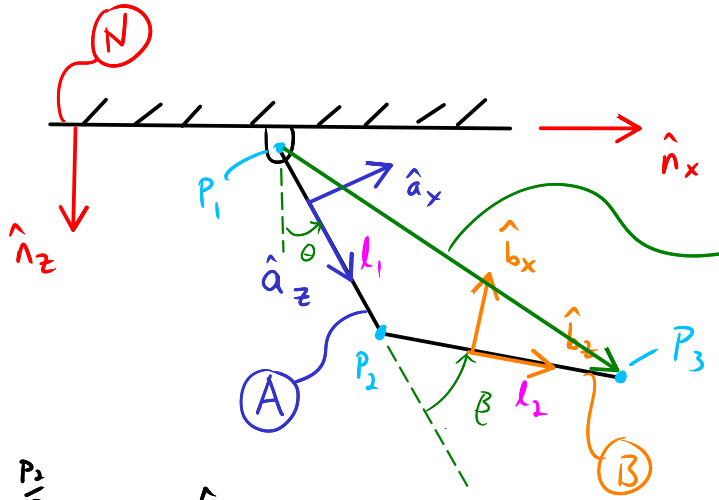
$$\bar{r}^{P_2/P_1} = l_1 \hat{a}_z$$

$$\bar{r}^{P_3/P_2} = l_2 \hat{b}_z$$

$$\bar{r}^{P_4/P_3} = l_3 \hat{c}_z - l_4 \hat{c}_y$$

$$\bar{r}^{P_4/P_1}$$





is a function of scalars θ & β

$$\bar{r}^{P_2/P_1} = l_1 \hat{a}_z$$

$$\bar{r}^{P_3/P_2} = l_2 \hat{b}_z$$

$$\hat{a}_x = \cos\theta \hat{n}_x - \sin\theta \hat{n}_z$$

$$\hat{a}_z = \sin\theta \hat{n}_x + \cos\theta \hat{n}_z$$

$$\hat{b}_z = \sin\beta \hat{a}_x + \cos\beta \hat{a}_z$$

$$\bar{r}^{P_3/P_1} = \bar{r}^{P_3/P_2} + \bar{r}^{P_2/P_1}$$

$$\bar{r}^{P_3/P_1} = l_1 \hat{a}_z + l_2 \hat{b}_z$$

$$\bar{r}^{P_3/P_1} = l_1 \sin\theta \hat{n}_x + l_1 \cos\theta \hat{n}_z + l_2 \sin\beta \hat{a}_x + l_2 \cos\beta \hat{a}_z$$

$$\bar{r}^{P_3/P_1} = l_1 \sin\theta \hat{n}_x + l_1 \cos\theta \hat{n}_z + l_2 \sin\beta \cos\theta \hat{n}_x - l_2 \sin\beta \sin\theta \hat{n}_z + l_2 \cos\beta \sin\theta \hat{n}_x + l_2 \cos\beta \cos\theta \hat{n}_z$$

Expressed $\bar{r}^{P_3/P_1}$ in the N reference frame.