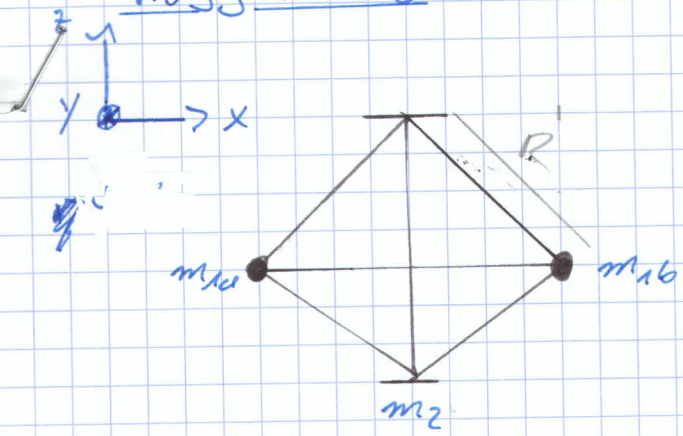
1 | 2 | 3 | 4
3,5 | 5 | 5 | 4

17.5 / 20

warum?

David Lars Jonas

Aufgabe 13



Ohne ZB: 8 Freiheitsgrade

Drehung um die z-Achse

→ Drehmatrix D

$$D = \begin{pmatrix} \cos(\omega t) & -\sin(\omega t) & 0 \\ \sin(\omega t) & \cos(\omega t) & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

m_2^{-1} ?

Zwangsbedingungen: $z_{m_2} = 2R\cos\theta$ ✓ $x_{m_2} = y_{m_2} = 0$ ✓

$x_{m_{1a}} = -x_{m_{1b}}$ ✓ $|\vec{r}_{m_{1a}} - \vec{r}_{m_2}| = R$ ✓

$z_{m_{1a}} = z_{m_{1b}}$ ✓ $|\vec{r}_{m_{1b}} - \vec{r}_{m_2}| = R$ ✓

$x^2 + y^2 + z^2 - R^2 = 0$?

Für m_{1a}:

$$\vec{r}_a = \begin{pmatrix} \cos(\omega t) & -\sin(\omega t) & 0 \\ \sin(\omega t) & \cos(\omega t) & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} R\sin\theta \\ 0 \\ R\cos\theta \end{pmatrix}$$

$$= \begin{pmatrix} R\cos(\omega t)\sin\theta \\ R\sin(\omega t)\sin\theta \\ R\cos\theta \end{pmatrix}$$

Für m_{1b}:

$$\vec{r}_b = \begin{pmatrix} \cos(\omega t) & -\sin(\omega t) & 0 \\ \sin(\omega t) & \cos(\omega t) & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} -R\sin\theta \\ 0 \\ R\cos\theta \end{pmatrix}$$

$$= \begin{pmatrix} -R\cos(\omega t)\sin\theta \\ -R\sin(\omega t)\sin\theta \\ R\cos\theta \end{pmatrix}$$

b)

$$\dot{\vec{r}}_a = \begin{pmatrix} -R\omega\sin(\omega t)\sin\theta + R\cos(\omega t)\cdot\dot{\theta}\cos(\theta) \\ R\omega\cos(\omega t)\sin\theta + R\sin(\omega t)\cdot\dot{\theta}\cos\theta \\ -R\dot{\theta}\sin\theta \end{pmatrix}$$

$$|\dot{\vec{r}}_a|^2 = R^2\omega^2\sin^2\theta + R^2\dot{\theta}^2\cos^2\theta + R^2\dot{\theta}\sin^2\theta$$

$$= R^2\omega^2\sin^2\theta + R^2\dot{\theta}^2$$