Exam

E x 0.7 + HW x 0.3 = total

90/80/--

exam viewing — M/T/W office hours

— ID.

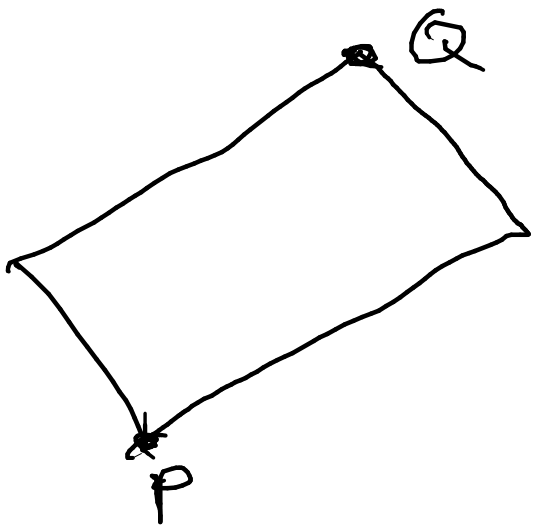
2nd chance exams. ⟶ CTF

— replace if higher.

— in feature ⟶ average of 2.

— PL HW1-4 + calculators.

Acceleration of RBs



$$\vec{r}_Q = \vec{r}_P + \vec{r}_{PQ}$$

$$\vec{v}_Q = \vec{v}_P + \dot{\vec{r}}_{PQ}$$

$$\downarrow$$

$$\vec{\omega} \times \vec{r}_{PQ}$$

rotation of Q about P

$$\vec{a}_Q = \vec{a}_P + \frac{d}{dt}(\vec{\omega} \times \vec{r}_{PQ})$$

$$\downarrow$$

$$\dot{\vec{\omega}} \times \vec{r}_{PQ} + \vec{\omega} \times \dot{\vec{r}}_{PQ}$$

$$\vec{\alpha} \times \vec{r}_{PQ} + \vec{\omega} \times (\vec{\omega} \times \vec{r}_{PQ})$$

3D

$$\vec{a}_Q = \vec{a}_P + \vec{\alpha} \times \vec{r}_{PQ} + \vec{\omega} \times (\vec{\omega} \times \vec{r}_{PQ})$$

2D

$$\begin{cases} \vec{\omega} = \omega_z \hat{k} \qquad \vec{r} = r_x \hat{i} + r_y \hat{j} \\ \Longrightarrow \vec{\omega} \times \vec{r} = \omega_z \vec{r}^{\perp} \end{cases}$$

$$\vec{a}_Q = \vec{a}_P + \alpha_z \vec{r}_{PQ}^{\perp} + \vec{\omega} \times (\omega_z \vec{r}_{PQ}^{\perp})$$

$$\downarrow$$

$$\omega_z (\omega_z \vec{r}_{PQ}^{\perp})^{\perp}$$

$$\downarrow$$

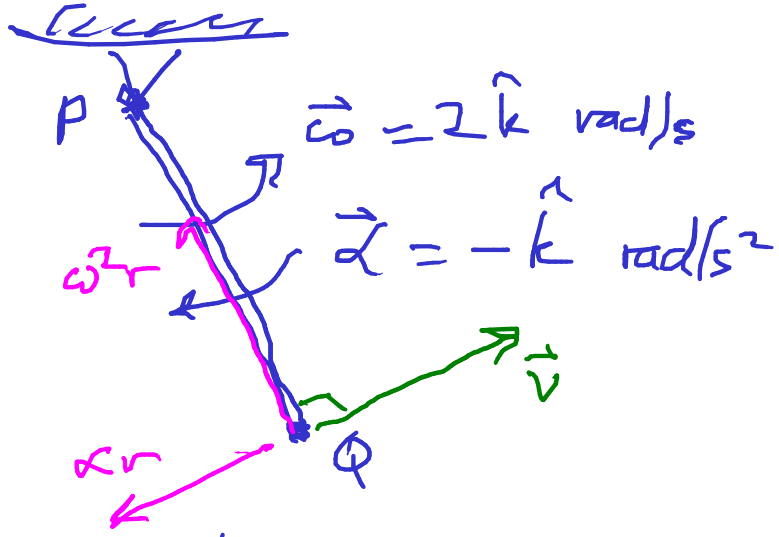
$$\omega_z^2 \vec{r}_{PQ}^{\perp\perp} \longrightarrow -\omega_z^2 \vec{r}_{PQ}$$

$$\boxed{\vec{a}_Q = \vec{a}_P + \alpha_z \vec{r}_{PQ}^{\perp} - \omega_z^2 \vec{r}_{PQ}}$$

$\alpha_z \vec{r}_{PQ}^{\perp}$: tang. acc of Q about P

$-\omega_z^2 \vec{r}_{PQ}$: centripetal acc of Q about P

Ex



$\vec{r}_{PQ} = 3\hat{i} - 4\hat{j}$ m

$\vec{v}_Q = 8\hat{i} + 6\hat{j}$ m/s

$\vec{a}_Q = \frac{-16}{}\hat{i} + \frac{13}{}\hat{j}$

$\vec{a}_Q = \vec{a}_P + \alpha_z \vec{r}_{PQ}^{\perp} - \omega_z^2 \vec{r}_{PQ}$

$\alpha_z \vec{r}_{PQ}^{\perp}$ → $-4, -3$

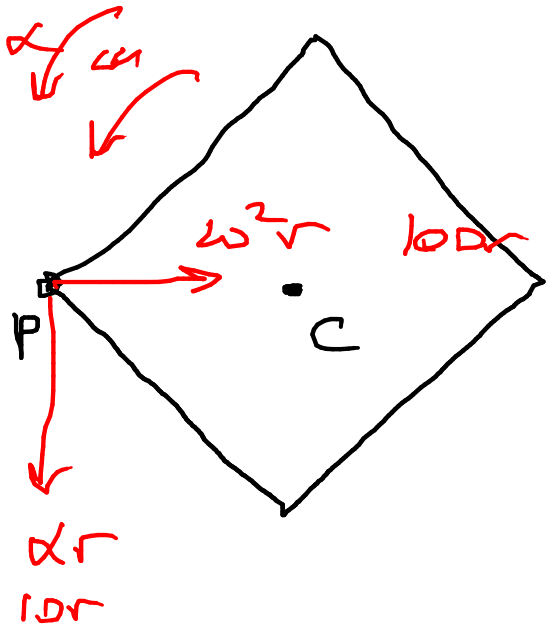
$-\omega_z^2 \vec{r}_{PQ}$ → $-12, 16$

$\alpha_z \vec{r}_{PQ}^{\perp}$

$-1(4\hat{i} + 3\hat{j})$

A. -3
B. -4
C. -7
D. -12
E. -16 m/s²

Ex



$\vec{a}_C = 0$

$\omega_2 = 10$ rad/s

$\alpha_2 = 10$ rad/s²

$\hat{a}_p$ dir :