

The Purdue Honor Code: As a Boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together. We are Purdue.

**PLEASE CIRCLE YOUR SECTION**

**Salmerón**  
8:30

**Krousgrill**  
9:30

**Silva**  
10:30

**Schwartz**  
10:30

**Krousgrill**  
11:30

**McDonald**  
11:30

**Frias-Miranda**  
12:30

**Krest**  
1:30

**Addis**  
3:30

**Andress**  
4:30

**INSTRUCTIONS:**

- Coordinate systems must be clearly identified.
- Please remember that for you to obtain maximum credit for a problem, you must present your solution clearly.
- If your solution cannot be followed, it will be assumed that it is in error.

Once you have completed the exam:

- Place the pages of your solution in the correct sequential order.
- Scan your completed solution. Make sure that the pages are readable.
- Upload the scanned solution to Gradescope.
- Place the hardcopy of the exam to the table in the front of the exam room. Failure to submit the hardcopy can prevent you from receiving a response on an exam regrade request.

**EQUATIONS**

$$\begin{aligned}\vec{v} &= \dot{x}\hat{i} + \dot{y}\hat{j} \\ &= v\hat{e}_t \\ &= \dot{r}\hat{e}_r + r\dot{\theta}\hat{e}_\theta\end{aligned}$$

$$\begin{aligned}\vec{a} &= \ddot{x}\hat{i} + \ddot{y}\hat{j} \\ &= \dot{v}\hat{e}_t + \frac{v^2}{\rho}\hat{e}_n \\ &= (\ddot{r} - r\dot{\theta}^2)\hat{e}_r + (r\ddot{\theta} + 2\dot{r}\dot{\theta})\hat{e}_\theta\end{aligned}$$

$$\vec{v}_B = \vec{v}_A + \vec{\omega} \times \vec{r}_{B/A}$$

$$\vec{a}_B = \vec{a}_A + \vec{\alpha} \times \vec{r}_{B/A} - \omega^2 \vec{r}_{B/A}$$