

Homework No. 10A (Fall 2023)

PHYS 205A-002: UNIVERSITY PHYSICS

School of Physics and Applied Physics, Southern Illinois University–Carbondale

Due date: Monday, 2023 Nov 13, 2:00 PM, on D2L

Instructions

- You are encouraged to use any of the resources to complete this homework. However, the extent to which you depend on resources while doing homework is usually a measure of how much extra work you need to put in to master the associated concepts. Solutions should be the last resource.
- Describe your thought process in detail and organize it clearly. Make sure your answer has units and the right number of significant digits.
- After completion, scan the pages as a single PDF file, and submit the file on D2L (under Assessments → Assignments).

Problems

1. (**10 points.**) A circular disc in the xy plane rotates about the z axis. This rotation is described by the angular velocity vector

$$\boldsymbol{\omega} = \hat{\mathbf{z}} \omega, \quad (1)$$

where $\omega = 75$ radians/s is the magnitude of the vector and represents the angular speed. Given the relation,

$$\mathbf{v} = \boldsymbol{\omega} \times \mathbf{r}, \quad (2)$$

where \mathbf{r} is the position and \mathbf{v} is the linear velocity of a point on the disc, find the linear velocity of a point on the disc at

$$\mathbf{r} = \hat{\mathbf{x}} 0.20 \text{ m}. \quad (3)$$

[[Solution](#)]

2. (**10 points.**) Starting from rest a wheel rotates with uniform angular acceleration 3.0 rad/s^2 . Determine the instantaneous angular velocity of the wheel after 3.0 s .

[[Solution](#)]

3. (**10 points.**) The angular position of a point on the rim of a rotating wheel is given by $\theta = 4.0 t - 2.0 t^2 + t^3$, where θ is in radians and t is in seconds.

- (a) Determine the angular velocity at $t = 6.0$ s.
- (b) Determine the instantaneous angular acceleration at $t = 6.0$ s.

[[Solution](#)]

4. (**10 points.**) A motorcycle accelerates uniformly from rest and reaches a linear speed of 24.0 m/s in a time of 8.00 s. The radius of each tire is 0.300 m. What is the magnitude of the angular acceleration of each tire?

[[Solution](#), [2022S FE P05](#), [2021S FE P08](#)]