Science Virtual Learning

MPI Physics

Rotational Kinematics 5: Motion Examples

April 13, 2020

Lesson: MPI Rotational Kinematics 5 – Motion Examples
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Objective: To learn how to use the 5 rotational motion equations to solve problems

- The following video shows two examples of how to solve rotational motion problems.
- Use the equations shown here ➡
- https://youtu.be/MLeT0z0861Y

Equation	Missing
1. $\omega_f = \omega_i + \alpha t$	$\Delta\theta$
2. $\Delta\theta = \frac{1}{2}(\omega_f + \omega_i)t$	α
3. $\Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2$	ω_f
4. $\omega_f^{\,2} = \omega_i^{\,2} + 2\alpha\Delta\theta$	t
5. $\Delta\theta = \omega_f t - \frac{1}{2}\alpha t^2$	ω_i

Videos: Rotational Motion Examples

Homework 1

20. A figure skater is spinning with an angular velocity of +15 rad/s. She then comes to a stop over a brief period of time. During this time, her angular displacement is +5.1 rad. Determine **(a)** her average angular acceleration and **(b)** the time during which she comes to rest.

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/uA1CMTGE6es

Homework 2

23. A wind turbine is initially spinning at a constant angular speed. As the wind's strength gradually increases, the turbine experiences a constant angular acceleration of 0.140 rad/s^2. After making 2870 revolutions, its angular speed is 137 rad/s. **(a)** What is the initial angular velocity of the turbine? **(b)** How much time elapses while the turbine is speeding up?

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/3_bxSYCAG5w

Homework 3

***29.** mmh The drive propeller of a ship starts from rest and accelerates at 2.90×10^{-3} rad/s^2 for 2.10×10^{3} s. For the next 1.40×10^{3} s the propeller rotates at a constant angular speed. Then it decelerates at 2.30×10^{-3} rad/s^2 until it slows (without reversing direction) to an angular speed of 4.00 rad/s. Find the total angular displacement of the propeller.

- This one is harder, because you have to break it into 3 parts.
- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/g52LEY2jKmg

That’s it!