Name: _____ DISC: _____ Score: _____ / 20

Instructions:

- Do your own work.
- Answer the questions below in the space provided.
- Make sure you show all your work and any equations that you use.
- Please place a box around your answers.
- Remember to give the correct units with all numerical answers

Q1	Q2	Q3	Q4
10	10	5	5

1. Consider a block tied to a string which rotates with constant speed on a frictionless surface as shown in the diagram.

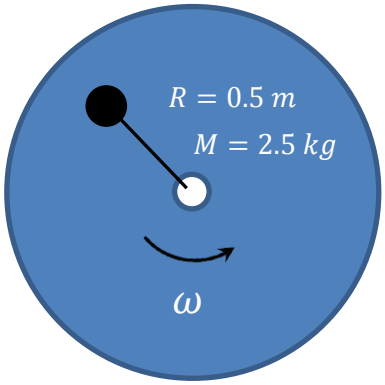


Figure 1: Top View of Rotating Block

R (disk-to-block)	M (block)	I	ω
$0.5\ m$	$2.5\ kg$	MR^2	$16\ rad/s$

Table 1: Properties of the System

a. There are external torques acting on this system?
   i. No, the table is frictionless.
   ii. Yes, the string has tension pulling on the block.

External Torques (2 pts):

b. Like translational momentum, angular momentum is a conserved quantity. In your own words, explain the conditions under which angular momentum is conserved.

Explanation of Conservation (3 pts):

c. Remember, angular momentum is $L = I\omega$. What is the angular momentum of the block?

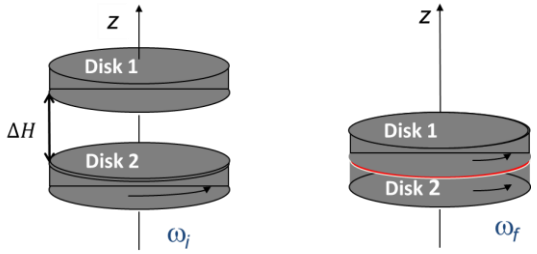
Angular Momentum (2 pts):

d. You pull on the string, reducing the radius of the rotation by $R/4$. Calculate the new rotational velocity ω_{new}.

New speed (3 pts):

2. Consider the system of two disks as shown in the diagram. The important parameters are given in the table:

DISK	MASS	RADIUS	MOMENT OF	INITIAL ω
1	$25\ kg$	$0.5\ m$	$^1/_2 MR^2$	$0\ rad/s$
2	$12\ kg$	$0.5\ m$	$^1/_2 MR^2$	$15\ rad/s$



Initial (Start) Final (Finish)

a. Disk 1 is initially stationary and Disk 2 is initially rotating as shown in the *Initial* diagram. Disk 1 suddenly falls resulting in the situation in the *Final* diagram. Explain in your own words what you expect to happen.

Explanation (3 pts):

b. Calculate the angular momentum for the *Initial* system:

Angular Momentum (2 pts):

c. What is the final angular momentum of the system?

Angular Momentum (2 pts):

d. Find the final rotational speed (ω_f) of the system of disks in the *Final* diagram.

Final speed (3 pts):