Lab: Rotational Motion Name_____

EVALUATION OF DATA

In order to find a relationship between torque and angular acceleration, you need to know the value of the net torque acting on the system in each of the trials you performed. Since you were not able to measure the torque directly, you must derive an expression you can use to determine the torque from quantities that you *could* measure. We will do this in class.

Calculated Data for One Rotating Aluminum Disk			
Mass of Aluminum Disk:		Radius of Rotary Sensor Device:	
Data Point	Average Angular Acceleration (rad/s^2)	Calculated Tension (N)	Calculated Net Torque (Nm)
1			
2			
3			
4			
5			
6			
7			
8			

Calculated Data for Two Rotating Aluminum Disks

Mass of BOTH Aluminum Disks: Radius of Rotary Sensor Device:

Data Point	Average Angular Acceleration (rad/s^2)	Calculated Tension (N)	Calculated Net Torque (Nm)
1			
2			
3			
4			
5			
6			
7			
8			

Data for Rotating Masses on Rod

Mass of Rod: Mass of Each Knob:
Radius of Rotary Sensor Device: Distance of Knobs from Pivot:

Data Point	Average Angular Acceleration (rad/s^2)	Calculated Tension (N)	Calculated Net Torque (Nm)
1			
2			
3			
4			
5			
6			
7			
8			

<u>Example Calculations</u>: Show one example of each type of calculation performed in the above tables of calculated data.

<u>Part 1 – One Rotating Disk</u>

1. Plot a graph of net torque *vs.* angular acceleration.
2. If the relationship between net torque and angular acceleration appears to be linear, fit a straight line to your data.
3. Write a statement that describes the relationship between the net torque acting on the disk and its angular acceleration. Write this statement below the graph in a document. Make sure the graph has an appropriate title and labeled axes with units.
4. Write the equation that represents the relationship between the net torque acting on the disk and its angular acceleration. Write this below the graph, following the statement of the relationship. Be sure to label this data set with the value of the mass of the disk.

<u>Part 2 – Two Rotating Disks</u>

5. Choose New Data Set from the Data menu.
6. Plot a graph of net torque *vs.* angular acceleration. If the relationship between net torque and angular acceleration appears to be linear, fit a straight line to your data. Both data sets should appear on the same graph. Write a statement that describes the relationship between the net torque acting on the disk and its angular acceleration. Write this statement below the graph in a document.
7. Write the equation that represents the relationship between the net torque acting on the pair of disks and their angular acceleration. Write this below the graph, following the statement of the relationship. Be sure to label this data set with the value of the mass of the disk.

<u>Part 3 – Rotating Masses on Rod</u>

12. Choose New Data Set from the Data menu. Plot a graph of net torque *vs.* angular acceleration. If the relationship between net torque and angular acceleration appears to be linear, fit a straight line to your data.
13. Write a statement that describes the relationship between the net torque acting on the disk and its angular acceleration. Write this statement below the graph in a document. This is a separate graph from Parts 1 and 2. Write the equation that represents the relationship between the net torque, acting on the rod and weights and their angular acceleration.

Conclusion

What does the slope and y-intercept of each of these graphs represent? What meaning can you extract from the different slopes you see on the 3 graphs?

Attach the 2 graphs (1 graph has 2 lines (Parts 1 and 2) and the other has 1 (Part 3)) to this lab before turning it in.