Name: DISC: Score: / 20

Instructions:

|  |  |  |  |
| --- | --- | --- | --- |
| Q1 | Q2 | Q3 | Q4 |
|  |  |  |  |
| 10 | 10 | 5 | 5 |

* 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

1. A solid cylinder of radius , and mass rolls without slipping down an inclined plane of length with an angle of with respect to the horizontal surface. The cylinder starts from rest at the top of the incline.
   1. Draw a figure which describes the cylinder and inclined plane *before* the cylinder starts to roll. Remember to label all parts of the diagram.

Figure (2 pts):

* 1. As the cylinder rolls down the incline which of the following occur (select all correct responses):
     1. Momentum is conserved.

Selections (2 pts):

* + 1. Potential energy is converted into kinetic energy.
    2. The cylinder will have both rotational and translational kinetic energy.
  1. What is the potential energy of the cylinder at the top of the incline ()?

Potential Energy (2 pts):

* 1. What is the total kinetic energy (at the bottom of the incline (hint: total energy is conserved).

Total Kinetic Energy (2 pts):

* 1. Using the fact that , find the rotational speed of the cylinder at the bottom of the ramp. For a solid cylinder

Rotational Speed (2 pts):

1. A solid, horizontal disk is free to rotate about its center. The disk has a mass and a radius . A force of acts tangentially at the edge of the disk.
   1. What is the torque on the disk ()?

Torque (3 pts):

* 1. The disk starts rotating from rest. We can relate the torque to the angular acceleration through . What is the angular acceleration of the disk?

Angular Acceleration (2 pts):

* 1. Recall: . Calculate the angular speed of the disk at .

Angular speed (2 pts):

* 1. What is the kinetic energy of the disk at ?

Kinetic Energy (3 pts):