Name: DISC: Score: / 20

Instructions:

|  |  |  |  |
| --- | --- | --- | --- |
| Q1 | Q2 | Q3 | Q4 |
|  |  |  |  |
| 5 | 5 | 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. You and your roommate are playing a game of catch. The graph shows the position of the ball as a function of time.
   1. Using the graph, estimate the speed *v* at the time when the ball has reached its maximum height.

Set-up:

Algebra:

* 1. Estimate the speed *v* at and . Sketch a speed vs. time plot using the three speeds you estimated, including the speed in part (a). What do you observe?

Speeds:

Graph:

Observation:

1. You are pushing a cart up a hill when the wheels fall off. If the hill makes an angle θ with the horizontal:
   1. Draw a free-body diagram and label all of the forces. Include the coordinate system.

Diagram:

Force Labels:

* 1. The cart has a mass . Let and the coefficient of kinetic friction . How much force must you apply to the cart to maintain a constant velocity up the hill? Assume you can direct your push directly up the hill.

Set-up:

Algebra:

Substitutions:

1. Two blocks are attached to each other by a massless cord as shown in the diagram below. Both the table and pulley are *frictionless*:

Force Vectors:

Labels:

* 1. Finish the free-body diagram by including all of the forces which can act on the blocks.
  2. Can this system be in equilibrium? Explain your reasoning.

Answer:

Explanation (2 pts):

1. You want to determine the height of a mountain 100 km from your current position. You look around and notice that about 500 m away from you is a tall tree. You look up and notice that the peak of the mountain and the top of the tree are aligned.
   1. Describe how you would use this information to find the height of the mountain. What information do you still need to solve the problem?

Description:

Missing information:

* 1. The tree is 100 m tall. How tall is the mountain?

Set-up:

Algebra:

Substitutions: