

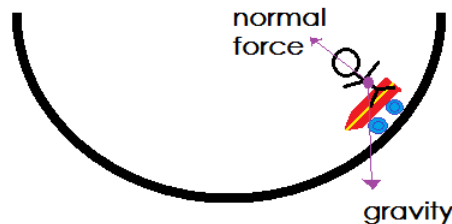
Free Body Diagrams

Instructor's Handout

Note: The following problems have been adapted from the MIT Mechanical Engineering Course 2.003, Dynamics and Controls I, from the Fall 2009 semester.

1 Problem 1

You decide to meet your friends at a skate park. You're skating in the half-pipe and start to think about forces, and how they keep your wheels on the ground. Draw a free-body diagram of you and your skateboard in the half-pipe.



Emphasize that gravity always points down (toward the center of the earth), and that the normal force always points out of the contact surface.

2 Problem 2

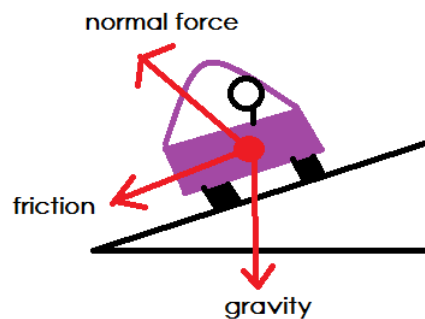
After the skate park, you head over to the carnival. You get in line for your favorite ride, the rotator. In case you've forgotten, the rotator is the ride in which you enter a chamber and stand against the wall. The chamber rotates and the floor drops away, but you remain stuck to the wall like a spider. Draw a free-body diagram that shows all of the forces acting on you during the ride.

Make sure to point out that friction acts along the surface of contact, and that normal force is again point out from the contact surface.



3 Problem 3

You hop in your fancy sports car and head home from the carnival. On the way home, you decide to stop at a racetrack. As you take your car around a banked curve, you find yourself thinking once more about forces, and how they are keeping your car from slipping off of the curve. Draw a free-body diagram of your car as it drives along a banked curve.



Again, note that friction points along the direction of the road.

Free Body Diagrams

Visualizing Forces

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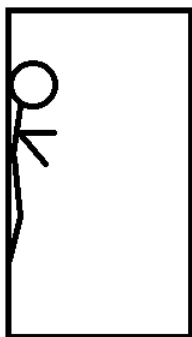
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