Lecture 16: Equations of Motion in Accelerated Frame

- It is sometimes easier to visualize and work problems in a non-inertial (accelerating) frame of reference.

- To solve such problems, it is easiest to take account of the accelerating frame by including a \textit{fake force}, equal to

\[ F_{\text{fake}} = -ma_{\text{frame}}. \]

- In this expression, the mass \( m \) is the mass of the body under consideration (recall the example of the person in the car, where \( m \) is the mass of the person, not the car) and \( a_{\text{frame}} \) is the acceleration of the reference frame. In the example from class, this would be the acceleration of the car.

- In the non-inertial reference frame, the dynamical equations are:

\[ \sum \mathbf{F} + F_{\text{fake}} = ma'. \]

- In this expression, \( a' \) is the acceleration of the object in the accelerating frame. In the example from class, \( a' \) was the acceleration of the passenger as observed by the driver.

- With the addition of the fake force, one can carry over the recipe for working out simple dynamical problems from Lecture 14 into non-inertial frames. That is, in Step 5, include the fake force as above, and find the acceleration \( a' \) in the non-inertial frame. (In many cases, \( a' = 0 \), because there is no motion in the non-inertial frame.)