



## Department of Physics

Physics 161, Calculus Mechanics and particle dynamics  
Quiz #2

1. Define an inertial reference frame
  
2. A physics student gets really frustrated with physics during their first exam. As a result of the frustration the student decides to throw their physics book off the top of the Physics department building. Assume that the text book is written by a fellow named Jackson titled "Electrodynamics" and can be represented nicely as a point particle with a mass of  $m$ . To the text book is imparted an initial constant velocity in magnitude of  $20\text{m/s}$  with an angle that is  $53^\circ$  relative to the horizontal of the top of the physics building which is  $50\text{ m}$  tall.
  - a) Find  $y_{\text{max}}$  (maximum height in the  $y$ -direction)
  - b) And the time it takes to get to  $y_{\text{max}}$ .
  - c) What is the velocity and direction of the text book at  $y_{\text{max}}$ ?
  - d) Find the time needed for the text book to pass the top of the physics building for  $t > 0$ .
  - e) What is the velocity of the text book in the  $y$ -direction as it passes the top of the physics building?
  - f) Find the time that the text book takes to hit the ground.
  - g) What is the velocity of the text book when it hits the ground?
  - h) What is the  $x$ -coordinate of the text book at  $y_{\text{max}}$ ?
  - i) And what is the velocity of the text book in the  $x$ -direction at  $y_{\text{max}}$ ?
  - j) What is the velocity in the  $x$ -direction of the text book as it passes the top of the Physics building at  $t > 0$ ?
  - k) What is the velocity in the  $x$ -direction of the text book when it hits the ground?
  - l) In words, describe how the velocities of the text book compare in the  $y$ -direction and  $x$ -direction along the text book's trajectory to the ground.