7A. Two magnets are moving on a frictionless horizontal surface with the velocities shown below. They collide and stick together. Magnet A has a mass of 0.2 kg and a speed of 2 m/s prior to the collision. Magnet B has a mass of 0.3 kg and a speed of 1.0 m/s prior to the collision. Calculate their combined velocity vector after collision and express this vector in unit vector form.

7B. A tennis player strikes the ball with her racket while the ball is still rising. The ball speed before impact with the racket is $v_1 = 18$ ft/s and after impact its speed is $v_2 = 25$ ft/s with directions as shown in the figure. The 0.06 slug ball is in contact with the racket for 0.05 seconds.
   a. Calculate the force impulse acting on the ball in the horizontal direction during impact with the racket.
   b. Calculate the force impulse acting on the ball in the vertical direction during impact with the racket.
   c. Calculate the average force (constant with time) acting on the ball in the horizontal direction during impact with the racket.
   d. Calculate the average force (constant with time) acting on the ball in the vertical direction during impact with the racket.
805 year old Leslie "Granny" Jackson is enjoying a day out snowboarding with her eight-year old great granddaughter Annie. Granny is a seven-time World Champion slalom snowboarder who has been enjoying the slopes for seventy-five plus years. With Annie out in front, they are having a great time when suddenly, Annie hits an icy patch and starts to lose control. She swerves off the trail and Granny sees that Annie is headed toward the top edge of the dreaded "Deadman's Drift," a rock-strewn slope that plunges down to the Yellowknife river.

Granny takes off after Annie and within seconds realizes that she will not be able to prevent her from going over the crest of the "Drift." Granny decides that her only hope is to try to snatch Annie off her board at the crest and together run the "Drift." She is able to reach and grab Annie just before the crest. Granny is traveling at 40 mph and Annie is traveling along a parallel path at 30 mph when Granny grabs her.

In an instant they are over the edge and headed down. Using all of her snowboarding skills and her vast knowledge of dynamics, Granny slaloms around the numerous boulders. She has run the "Drift" twice in her life and knows that the slope bottoms out right at the edge of the Yellowknife and forms a natural ramp that she can use to jump the river. Granny will have to be at just the right speed to make the jump and not lose control with Annie on the board, or they will fall short and into the river.

The distance from the crest measured straight down the slope to the ramp is 125 feet (point A to B). However, the distance traveled down the slope by Granny and Annie is 645 feet due to her twisting course. Granny weighs 120 lbs and Annie weighs 60 lbs. The geography of this location is illustrated below.

1. Calculate the velocity of Granny and Annie just after Granny grabs Annie (point A).
2. Assume that the coefficient of friction is 0.05 during her torturous path down the "Drift." Calculate the velocity of Granny and Annie at the edge of the river (point B).
3. Assume that they come off the ramp at an angle of 20 degrees from the horizontal and that points B and C have the same vertical height. Will they be able to jump the river or will they fall victim to its icy waters?