Answer the following questions:

1- A particle moves along a straight line such that its position is defined by $s = t^3 - 3t^2 + 2$ m. Determine the particle's average velocity and average speed during the first four seconds. Also, determine its acceleration at $t = 4$ s.
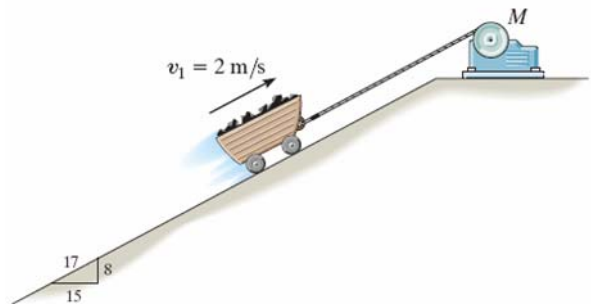
2- Measurements of a shot recorded on a videotape during a basketball game are shown. The ball passed through the hoop even through it barely cleared the hands of the player B who attempted to block it. Neglecting the size of the ball, determine the magnitude of its initial velocity v_A and the height h of the ball when it passes over player B.
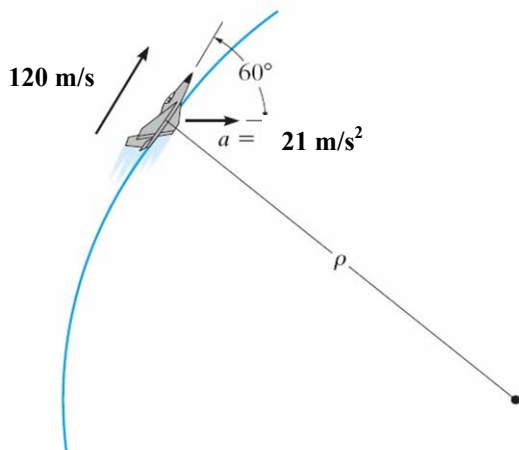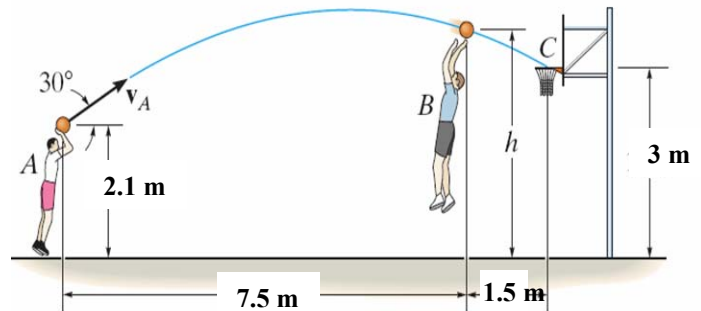
3- At a given instant the jet plane has a speed of 120 m/s and an acceleration of 21 m/s² acting in the direction shown. Determine the rate of increase in the plane's speed and the radius of curvature ρ of the path.

4- If the particle's position is described by the polar coordinates $r = 4(1 + \sin t)$ m and $\theta = 2e^{-t}$ rad, where t is in seconds and the argument for the sine is in radians, determine the radial and transverse components of the particle's velocity and acceleration when $t = 2$ s.

5- The 400 kg mine car is hoisted up the incline using the cable and motor M. For a short time, the force in the cable is $F = 3200t^2$ N, where t is in seconds. If the car has an initial velocity $v_1 = 2$ m/s at s = 0 and t = 0, determine the distance it moves up the plane when $t = 2$ s.

Good Luck