Quiz 1

Date: Friday, 02/09 **Time:** 11:00 AM$\sim$ 11:50 AM

(This is an open-book, open-note quiz. You must sign your name on this sheet and return it with your examination book. Academic misconduct (any type of cheating) will result in a failing grade in ENGN 2070-201 *Dynamics*.)

Name: _____

1. **(35%)** A four-pulley system is designed for lifting boxes, as shown in Figure 1. The velocity of point A is found to be $v_A(t) = 7\cos(10t) + 5t^3$ m/s. Determine the **acceleration at point B, a_B at $t = 3$ sec**. (Note: No need to indicate the direction of a_B.)

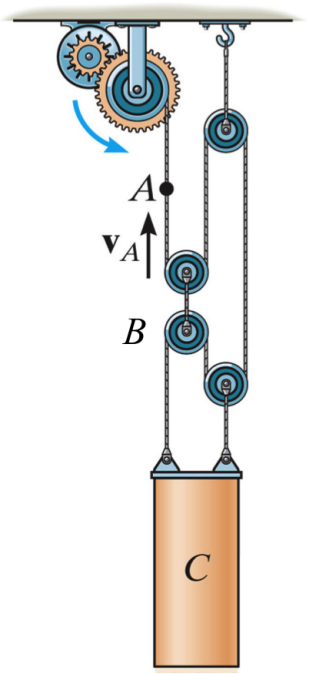

Figure 1: Absolute dependent motion of a pulley system

2. **(30%)** Figure 2 illustrates the curvilinear motion of a vehicle on a curved road. By using a laser doppler vibrometer, variables r (in meters) and θ (in radians) can be modeled by

$$r(t) = 7t^2 - 5t + 2 \tag{1}$$
$$\theta(t) = 4t - 3 \tag{2}$$

Determine the **acceleration of the vehicle at** $\theta = \dfrac{\pi}{4}$.

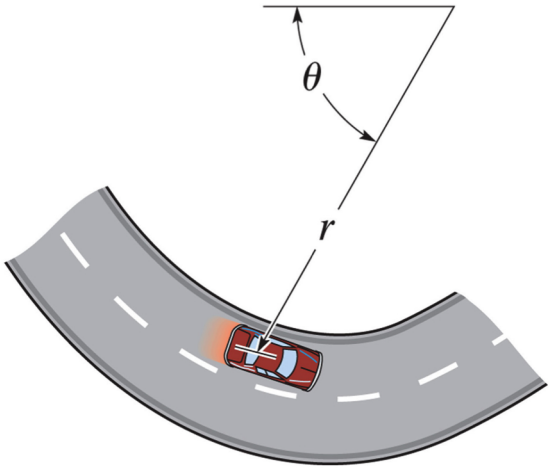

Figure 2: Curvilinear motion

3. **(35%)** In Figure 3, a vehicle at an initial speed of 30 mph took 15 ft to completely stop (and to avoid hitting two pedestrians), after the driver hit the brakes. Consider the same vehicle (and driver) at a different initial speed of 45 mph on the same road. What is the **distance** d the vehicle needs in order to reduce its speed to 25 mph (to avoid speeding)?

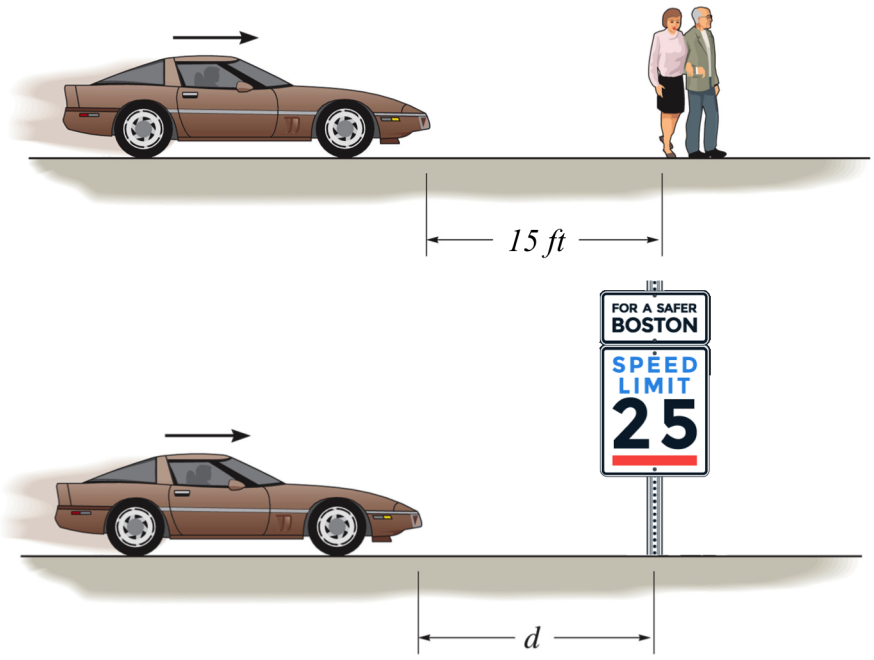

Figure 3: Motion of a vehicle