Exercises in Physics
Assignment # 4

Date Given: April 28, 2022
Date Due: May 12, 2022

P1. (2 points) At some instant of time, a particle has velocity $\boldsymbol{v} = \sqrt{3}\boldsymbol{i} + \boldsymbol{j}$ m/s, acceleration magnitude $|\boldsymbol{a}| = 5$ m/s^2, and the radius of curvature $\rho = 8/5$ m. Find the angle between the velocity and acceleration vectors of the particle at that instant.

P2. (2 points) A car travels along the level curved road with a speed which is decreasing at the constant rate of 0.6 m/s each second. The speed of the car as it passes point A is 16 m/s. Calculate the magnitude of the total acceleration of the car as it passes point B which is 120 m along the road from A. The radius of curvature of the road at B is 60 m.
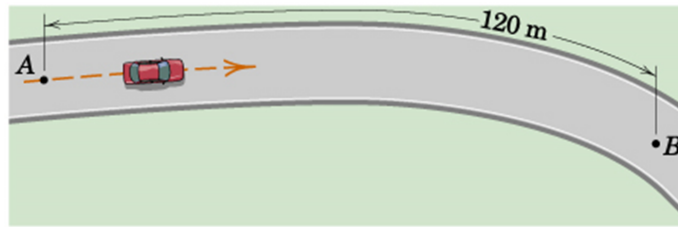

Figure 1: Illustration to Problem 2.

P3. (2 points) The car travels along the circular path such that its speed is increased by $a_t = (4t^2)$m/s^2, where t is in seconds. Determine the magnitudes of its velocity and acceleration after the car has traveled $s = 27$m starting from rest. Neglect the size of the car.
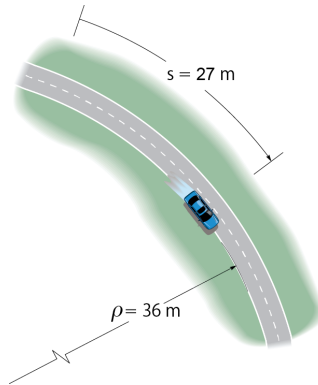

Figure 2: Illustration to Problem 3.

P4. (2 points) If the car passes point A with a speed of 20m/s and begins to increase its speed at a constant rate of $a_t = 0.5\text{m/s}^2$, determine the magnitude of the car's acceleration at point C where $s = 101.68\text{m}$ and $x = 0$.
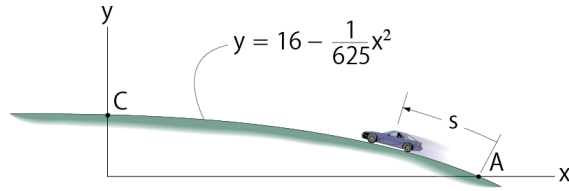

Figure 3: Illustration to Problem 4.