Homework H1.D

Given: Particle P moves along a path with its position on the path given by the arc length of s. The speed of P is given as a function of s as: $v_P = bs^2$, where s is given in meters and v_P in terms of meters/second. The radius of curvature of the path is given by ρ and the path tangent is at an angle of θ with respect to the direction of the x-axis.

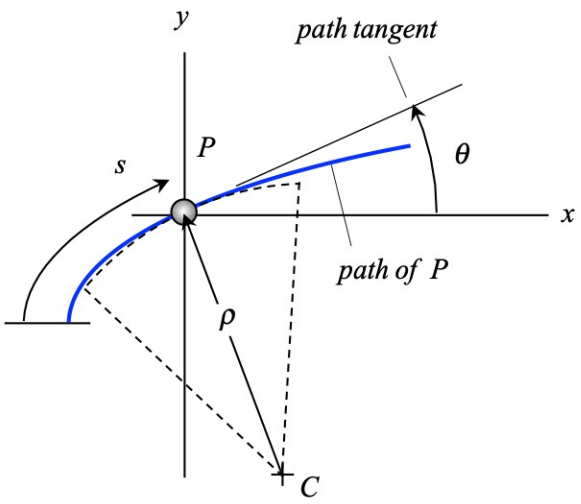
Find: At the position of P where $s = 3$ m:

(a) Make a sketch of the path unit vectors $\hat{e}_t$ and $\hat{e}_n$.

(b) Determine the velocity and acceleration of P in terms of path unit vectors $\hat{e}_t$ and $\hat{e}_n$.

(c) Determine the velocity and acceleration of P in terms of Cartesian unit vectors $\hat{i}$ and $\hat{j}$.

(d) Determine the xy-components of location of the center of curvature, C, for the path.



Use the following parameters in your work: $b = 0.5$/m-s, $\rho = 5$ m and $\theta = 30°$.