Problem H1.G

Given: Particle P moves along a hyperbolic path described in Cartesian coordinates as: $xy = b$, where x and y are given in feet. It is known that P moves in such a way that $\dot{x} = c =$ constant.

Find: For the position of $x = 2$ ft:

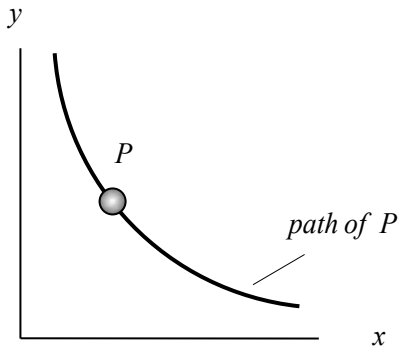
(a) determine the velocity and acceleration of P. Write your answers as vectors in terms of their Cartesian components.

(b) determine the Cartesian components of the unit path vector $\hat{e}_t$.

(c) show the position of P and the path unit vectors $\hat{e}_t$ and $\hat{e}_n$, along with $\vec{v}_P$ and $\vec{a}_P$, in a sketch.

(d) determine numerical values for the rate of change of speed $\dot{v}_P$ of P and the radius of curvature ρ_P for the path of P.

(e) is the speed of P increasing or decreasing? Explain.



Use the following parameters in your analysis: $b = 6$ ft^2 and $c = 30$ ft/s.