

Homework H.1.G

Given: Particle P travels within the x - y plane along a path given by $y(x) = x^2/2 - 10x$, where x and y are given in feet. The x -component of the position for P is changing at a constant rate of \dot{x} .

Find: For this problem:

- (a) Make a sketch of the path of particle P.
- (b) Determine the velocity and acceleration of P.
- (c) Show the velocity and acceleration vectors of P in your sketch of P's path.
- (d) Determine the rate of change of speed of P.

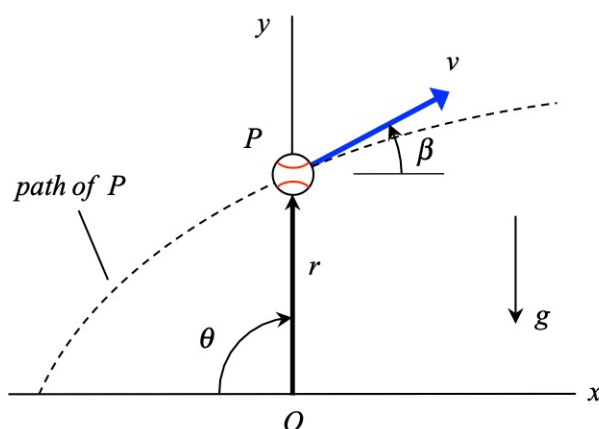
Use the following parameters in your analysis: $\dot{x} = 5$ ft/s and $x = 10$ ft.

Problem H.1.H

Given: A baseball P moves along the path in the vertical xy -plane shown below in the figure in the absence of air resistance. The velocity of P makes an angle of β with respect to the horizontal. The motion of P is monitored by an observer at O who is able to measure the radial distance r from O to P and the angle θ that the line OP makes with the horizontal, as shown in the figure. Note that since the air resistance is to be considered negligible, the acceleration of P is g vertically downward. At the position shown, line OP is vertical ($\theta = 90^\circ$) and $r = 6$ ft.

Find: For the position shown:

- Make a sketch of P showing the polar unit vectors \hat{e}_r and \hat{e}_θ , and the path unit vectors \hat{e}_t and \hat{e}_n .
- Determine numerical values for \dot{r} , $\dot{\theta}$, \ddot{r} and $\ddot{\theta}$.
- Write the path unit vectors \hat{e}_t and \hat{e}_n in terms of \hat{e}_r and \hat{e}_θ polar unit vectors.
- Determine the rate of change of speed of P, \dot{v} , and the radius of curvature, ρ , of the path of P at this position.



Use the following parameters in your analysis: $v = 100$ ft/s and $\beta = 36.87^\circ$.