## Homework H.4.M

Given: A cannonball P of mass $m$ is fired toward a steel barrier on a stationary cart. At some time after rebounding from the barrier, the cannonball is observed to have a speed of $v_{P}$ and is moving in the direction shown below in the figure. Let $M$ be the combined mass of the cannon/cart. Assume that the cart is able to move without friction along the horizontal surface and ignore the influence of air resistance.

Find: For this problem:
(a) Determine the velocity vector of the cart after the cannonball bounces off the steel barrier at the instant shown below;
(a) If $\Delta t$ represents the elapsed time between the firing of the cannonball and the instant shown below, determine the average value of the horizontal force acting on the combined cannon/cart over the time period of $0<t<\Delta t$.


Use the following parameters in your analysis: $m g=80 \mathrm{lb}, M g=240 \mathrm{lb}, \Delta t=0.3 \mathrm{~s}, \theta=20^{\circ}$ and $v_{P}=100 \mathrm{ft} / \mathrm{s}$.

