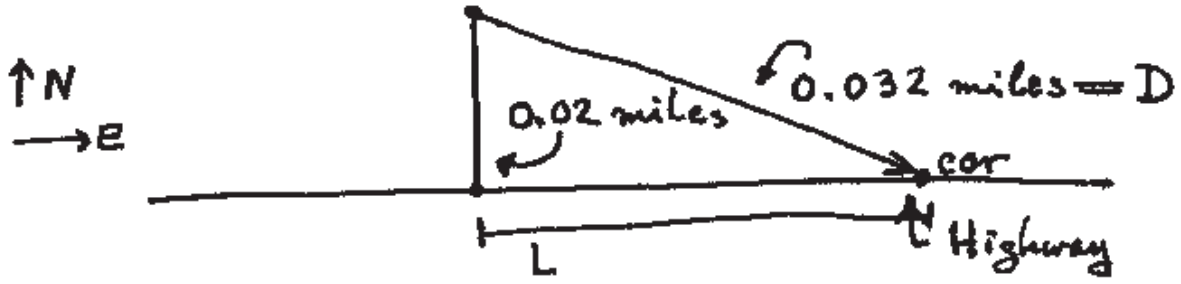
9. (13 points) A car is driving east along a straight highway, and Police Officer Doright is stationed 0.02 miles north of the highway. After the car passes by, Officer Doright attempts to measure its position and velocity with his radar detector. This device tells him the distance D between himself and the car. Instead of telling him the true velocity of the car, it tells the instantaneous rate of change of the distance between him and the car.

The radar detector reads "D: 0.032 miles, dD/dt: 65 mph".

a) (5 pts) Draw a diagram indicating the positions of the road, of Officer Doright and of the other car. Include all information you can, and label your picture clearly.



a) (8 pts) Calculate the velocity of the car.

The car's velocity is just $\frac{dL}{dt}$, where L is the distance marked along the road.

But $D(t)$ is the length of the hypotenuse and so $L(t) = \sqrt{D^2(t) - (0.02)^2}$.

Thus, $\frac{dL}{dt} = \frac{D(t)\,D'(t)}{\sqrt{D^2(t) - (0.02)^2}}$.

We know, then, $\frac{dL}{dt} = \frac{(0.032)\cdot 65}{\sqrt{(0.032)^2 - (0.02)^2}} \approx 83.2$

(Units are MPH.)