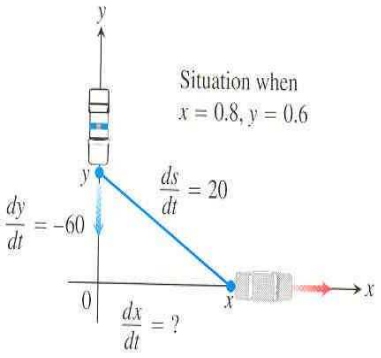
Example A police cruiser, approaching a right-angled intersection from the north is chasing a speeding car that has turned the corner and is now moving straight east. When the cruiser is 0.6 miles north of the intersection and the car is 0.8 mi to the east, the police determine with radar that the distance between them and the car is increasing at 20 miles per hour. If the cruiser is moving at 60 miles per hour at the instant of measurement, what is the speed of the car?



Let "s" be the distance between the two cars and x be the distance of the car to the intersection and y be the distance of the cruiser's. We have the question related info all listed on the figure. We will use the Pythagorean Theorem to find the "connection" equation again. $x^2 + y^2 = s^2$.Next take the derivative of both sides with respect to t to get

$$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2s\frac{ds}{dt}$$

If x = 0.8 and y = 0.6, then we can find s by plugging these values into $x^2 + y^2 = s^2$ and solving it we will get $s = 1$. We also know that $\frac{dy}{dt} = -60$ since the car is moving south, or down as our picture states. In addition $\frac{ds}{dt} = 20$ since this is how much the distance between the cars is changing. We will put all of these known values in our differentiation result

$$2(0.8)\frac{dx}{dt} + 2(0.6)(-60) = 2(1)(20) \Rightarrow \frac{dx}{dt} = 70mi/hr$$