

Problem 10.8 A 3-cm-wavelength radar is located at the origin of an x - y coordinate system. A car located at $x = 100$ m and $y = 200$ m is heading east (x -direction) at a speed of 120 km/hr. What is the Doppler frequency measured by the radar?

Solution:

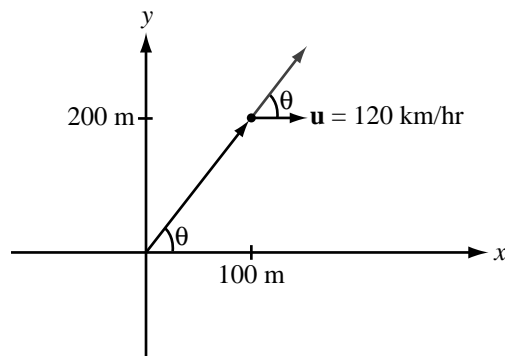


Figure P10.8: Geometry of Problem 10.8.

$$\theta = \tan^{-1} \left(\frac{200}{100} \right) = 63.43^\circ,$$

$$u = 120 \text{ km/hr} = \frac{1.2 \times 10^5}{3600} = 33.33 \text{ m/s},$$

$$f_d = \frac{-2u}{\lambda} \cos \theta = \frac{-2 \times 33.33}{3 \times 10^{-2}} \cos 63.43^\circ = -993.88 \text{ Hz}.$$