

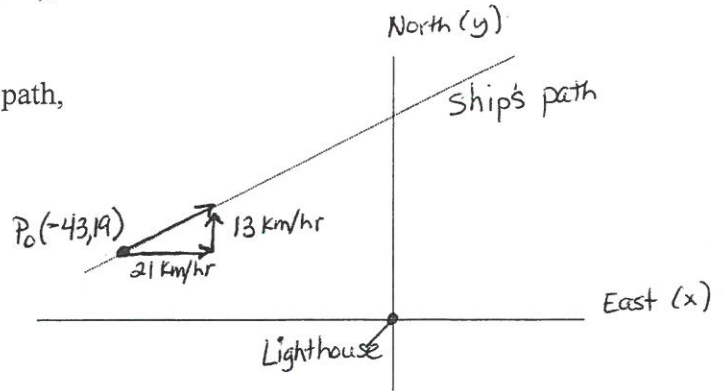
Notes 13.5 Parametric Equations for Moving Objects

1. A ship moves with an eastward velocity of 21 km/hr and a northward velocity of 13 km/hr. At time $t = 0$ hour the ship is at the point $P_0(-43, 19)$, where the distances are in kilometers from a lighthouse. See picture.

- a) Find parametric equations for the ship's path, using t hours as the parameter.

$$x = -43 + 21T$$

$$y = 19 + 13T$$



- b) Predict the time when the ship will be 60 km north of the lighthouse.
c) How far east or west of the lighthouse will it be at this time?

$$60 = 19 + 13T$$

$$41 = 13T$$

$$\frac{41}{13} \approx \boxed{3.155 = T}$$

$$x = -43 + 21\left(\frac{41}{13}\right)$$

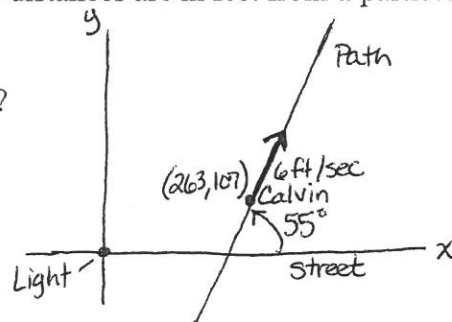
$$\boxed{x \approx 23.23 \text{ Km E of lighthouse}}$$

2. Calvin is walking at a speed of 6 ft/sec along a path that makes an angle of 55° with the x-axis. At time $t = 0$ he is at the point $(263, 107)$, where the distances are in feet from a particular traffic light. See picture.

- a) What are Calvin's speeds in the x- and y-directions?

$$x = 6 \cdot \cos 55^\circ \approx 3.44 \text{ ft/s}$$

$$y = 6 \cdot \sin 55^\circ \approx 4.91 \text{ ft/s}$$



- b) Write parametric equations for his position as a function of the parameter t seconds.

$$x = 263 + 3.44T$$

$$y = 107 + 4.91T$$

- c) A street goes along the x-axis. Assuming Calvin was walking at his 6 ft/sec pace before $t = 0$, at what time t did he cross the street?

$$0 = 107 + 4.91T \quad -107 = 4.91T \quad T \approx -21.79 \text{ so}$$

$$\boxed{\approx 22 \text{ sec ago}}$$

- d) How far from the light does the path cross the street?

$$x = 263 + 3.44(-21.79) =$$

$$x \approx 188$$

$$\boxed{\approx 188 \text{ ft to E}}$$