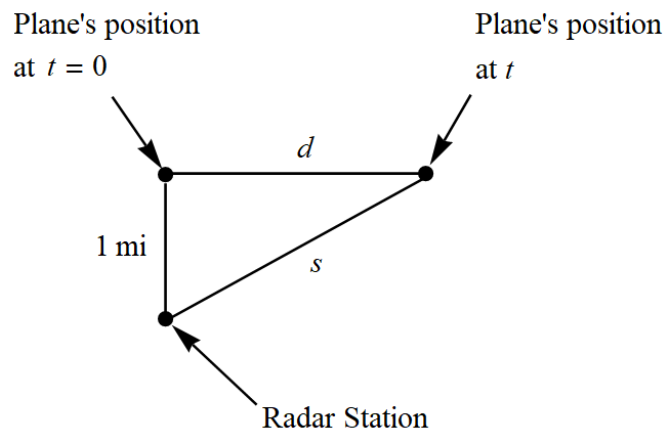


## Exercise 58

An airplane is flying at a speed of 350 mi/h at an altitude of one mile and passes directly over a radar station at time  $t = 0$ .

- Express the horizontal distance  $d$  (in miles) that the plane has flown as a function of  $t$ .
- Express the distance  $s$  between the plane and the radar station as a function of  $d$ .
- Use composition to express  $s$  as a function of  $t$ .

### Solution



Use the Pythagorean theorem to express  $s$  in terms of  $d$ .

$$1^2 + d^2 = s^2$$

Take the square root of both sides.

$$s = \sqrt{d^2 + 1}$$

The speed of the ship is 350 mi/h, so

$$d = 350t \text{ mi,}$$

where  $t$  is in hours. Plugging this formula for  $d$  into the one for  $s$  gives the distance from the radar station (in miles) as a function of time.

$$s(t) = \sqrt{(350t)^2 + 1} \text{ mi} = \sqrt{122\,500t^2 + 1} \text{ mi}$$