

# Lab Worksheet for September 23, 2021

Practice with Related Rates.

1.

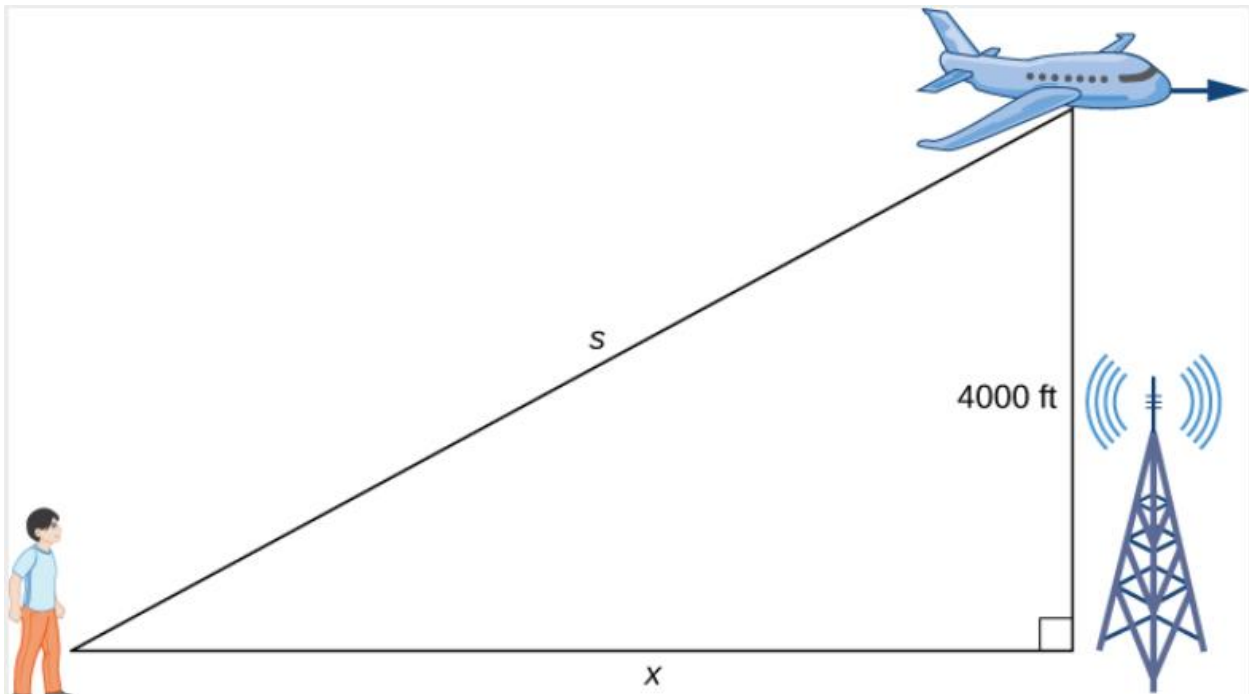
The volume of a sphere in cubic centimeters of radius  $r$  centimeters is

$$V = \frac{4}{3}\pi r^3.$$

A spherical balloon is being filled with air at a constant rate of  $2\text{cm}^3/\text{sec}$ . How fast is the radius increasing when the radius is  $3\text{cm}$ ?

2.

An airplane is flying overhead at a constant elevation of 4000ft. A man is viewing the plane from a position 3000ft from the base of a radio tower. The airplane is flying horizontally away from the man. If the plane is flying at a rate of 600ft/sec, at what rate is the distance between the man and the plane increasing when the plane passes over the radio tower?

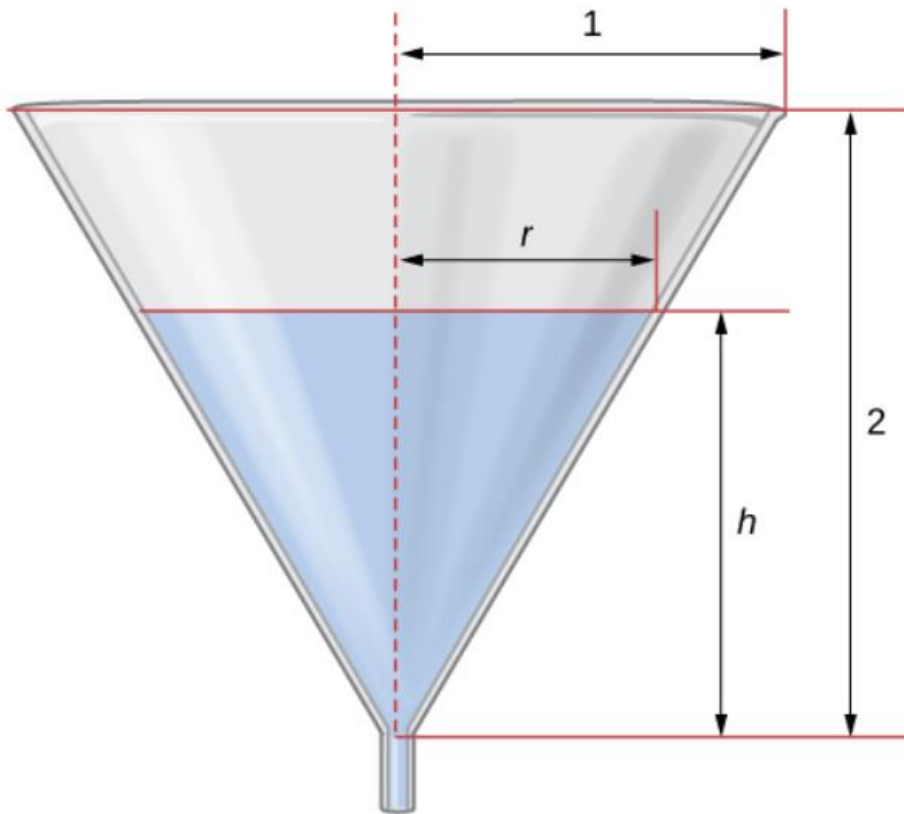


3.

The volume of water in cubic feet of a cone is

$$V = \frac{1}{3}\pi r^2 h$$

Water is draining from the bottom of a cone-shaped funnel at a rate of  $0.03\text{ft}^3/\text{sec}$ . The height of the funnel is 2 ft and the radius at the top of the funnel is 1 ft. At what rate is the height of the water in the funnel changing when the height of the water is  $\frac{1}{2}\text{ft}$ ?



**4.**

If two electrical resistors are connected in parallel, the total resistance (measured in ohms, denoted by the Greek capital letter omega,  $\Omega$ ) is given by the equation

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ . If  $R_1$  is increasing at a rate of  $0.5\Omega/\text{min}$  and  $R_2$  decreases at a rate of  $1.1\Omega/\text{min}$ , at what rate does the total resistance change when  $R_1=20\Omega$  and  $R_2=50\Omega$ ?

**5.**

You and a friend are riding your bikes to a restaurant that you think is east; your friend thinks the restaurant is north. You both leave from the same point, with you riding at 16 mph east and your friend riding 12mph north. After you traveled 4mi, at what rate is the distance between you changing?