1. The length of a rectangle is increasing at a rate of 8 cm/s and its width is increasing at a rate of 3 cm/s. When the length is 20 cm and the width is 10 cm, how fast is the area of the rectangle increasing?

(a) What quantities are given in the problem? What is the unknown quantity? Give all the quantities notation.

(b) Draw a picture of the situation, and label it with your notation from part a).

(c) Write an equation that relates the quantities.

(d) Solve the problem for the unknown quantity.
2. A plane flying horizontally at an altitude of 1 mi and a speed of 500 mi/h passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 mi away from the station.

(a) What quantities are given in the problem? What is the unknown quantity? Give all the quantities notation.

(b) Draw a picture of the situation, and label it with your notation from part a).

(c) Write an equation that relates the quantities.

(d) Solve the problem for the unknown quantity.
3. For each word problem below, do parts a) and b) as above (you do not need to actually solve the problem).

Determine the quantities in the problem and give them notation. Draw a diagram, labeling the quantities with the notation you gave it. Identify which quantity is unknown.

(a) If a snowball melts so that its surface area decreases at a rate of 1 cm$^2$/min, find the rate at which the diameter decreases when the diameter is 10 cm.

(b) The altitude of a triangle is increasing at a rate of 1 cm/min while the area of the triangle is increasing at a rate of 2 cm$^2$/min. At what rate is the base of the triangle changing when the altitude is 10 cm and the area is 100 cm$^2$?

(c) A spotlight on the ground shines on a wall 12 m away. If a man 2 m tall walks from the spotlight toward the building at a speed of 1.6 m/s, how fast is the length of his shadow on the building decreasing when he is 4m away from the building?
(d) The top of a ladder slides down a vertical wall at a rate of 3 m/s. When the bottom of the ladder is 3 ft away from the wall, it slides away from the wall at a rate of 1 m/s. How long is the ladder?

(e) A lighthouse is located on a small island 3km away from the nearest point $P$ on a straight shoreline and its light make four revolutions per minute. How fast is the beam of light moving along the shoreline when it is 1 km from $P$?

(f) A man starts walking north at 4 ft/s from a point $P$. Five minutes later, a woman starts walking south at 5 ft/s from a point 500 ft due east of $P$. At what rate are the people moving apart 15 minutes after the woman starts walking?