

Steps to follow:

1. **Read the problem carefully.** Related rates problems can be recognized because the rate of change of one or more quantities with respect to time is given and the rate of change with respect to time of another quantity is required.

Use this reading to get familiar with the *general situation (the "character") of the problem.*

- What is the physical process involved?
- Is a geometric figure mentioned?
- What are the features of the process and/or figure?

You will often have to read the problem more than once to understand what is happening in the problem.

2. **Draw a diagram if possible.** It is very important to interpret correctly which parts of the figure are changing with respect to time and which parts fixed throughout. Basically there will be two (or more) varying quantities. *No numerical values should be assigned to any quantity varying with respect to time until after the derivative is taken.* (See Step 5.)
 - For any quantity which is not changing, label it in your diagram with a **constant**.
 - For any quantity which is changing, label it in your diagram with a **variable**.
 - Identify which rates you are given and which rates you are trying to find.
3. **Find an equation linking the varying quantities.** Sometimes, you will have to use substitution to eliminate one of the variables in the equation by using a fixed relationship between these variables. Often, the relationships will involve right triangles, rectangles, circles, cones or spheres.
4. **Use implicit differentiation** to differentiate each side of the equation *with respect to time*. You will need to use the Chain Rule when doing this.
5. **Insert specific information** into the resulting equation and solve for the unknown rate.

Problems:

1. An observer is tracking a small plane flying at an altitude of 5000 ft. The plane flies directly over the observer on a horizontal path at the fixed rate of 1000 ft/min. Find the rate of change of the distance from the plane to the observer when the plane has flown 12,000 feet after passing directly over the observer.

