

Guidelines to Solving Related Rates Problems:

1. Read the problem carefully.
2. Sketch and label a diagram. Be careful not to label a variable as a constant.
3. Write down known facts, relationships, and what you are trying to find.
4. Formulate a general equation that relates the variables in the problem.
5. Differentiate with respect to the appropriate variable (usually time).
6. Substitute specific values and solve for the unknown.

Examples:

1. The radius of a circle begins to increase at a rate of 2 inches per minute.
 - a) At what rate is the circumference increasing?
 - b) At what rate is the area increasing when the radius is 6 inches?

2. Two men start walking from the same point. One goes north at a rate of 4 miles/hr and the other east at a rate of 5 miles/hr. How fast is the distance between them changing after 8 hours?

3. A ladder 25 feet long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 feet per second. When the base of the ladder is 7 feet from the wall,
 - a) How fast is the top moving down the wall?
 - b) How fast is the area of the triangle changing?
 - c) How fast is the angle between the top of the ladder and the wall of the house changing?

4. A street light is mounted at the top of a 15 foot tall pole. A man 6 feet tall walks away from the pole at a speed of 5 feet per second along a straight path. How fast is the tip of his shadow moving when he is 40 feet from the pole?

5. Water runs into a conical tank at the rate of $9 \text{ ft}^3/\text{min}$. The tank stands point down and has a height of 10 ft and a radius of 5 ft. How fast is the water level rising when the water is 6 ft deep?