

Related Rate Problems

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Solving related rate problems involves six steps:

- (a) Identify the quantities that are relevant in the problem, and assign each a variable.
- (b) Identify the unknown quantity, and write it in terms of derivatives of the variables you have chosen.
- (c) Draw a picture of the situation for any time t .
- (d) Write an equation that relates the quantities.
- (e) Differentiate the equation (implicitly) with respect to time t .
- (f) Use the given information to solve for the unknown quantity.

Use these six steps to solve the following problems. Don't forget to give the correct units!

1. A right triangle has a base of length 5 m and a height that is increasing at a rate of 2 m/s. At what rate is the length of the hypotenuse increasing when the height is 12 m?
2. Two cars start moving from the same point at noon. One travels south at 60 mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing at 2:00 pm?
3. A trough is 10 ft long and its ends have the shape of isosceles triangles that are 3 ft across at the top and have a height of 1 ft. If the trough is being filled at a rate of 12 ft³/min, how fast is the water level rising when the water is 6 inches deep?
4. A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s. At what rate is the angle between the string and the horizontal decreasing when 200 ft of string have been let out?