

## HOW TO SOLVE IT

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according to G. Polya

RELATED RATES

Understand the problem.

Identify and name all relevant quantities.

What is the unknown?

What rate of change is to be found?

What are the data?  
(What is given?)

Which quantities are constant? Which are variable?  
What rates and quantities are given?

What is the condition?  
(What are the constraints?)

Make a sketch and label it.  
What relates the basic variables?

Devise a plan.

Write an equation relating the variables  
whose rates are given or to be determined.  
Plan to differentiate it and solve.

Carry out the plan.

Using the Chain Rule, differentiate both sides  
of the equation with respect to time  $t$ .  
Substitute all known values and solve for the  
desired rate of change.

Look back.

Check your solution.

Check the result.  
Can you derive the result differently?  
Can you use it for some other problem?

Is it reasonable?  
Can you see it at a glance?

Exercises on related rates in Hughes-Hallet et al. 3/e: Section 3.6 #48–55, pp. 137–138;  
Review Exercises and Problems for Chapter 3: #77–82, p. 161.