

## Math 41 — Tips for solving related rates problems

- Carefully read the problem statement — there is a definite style to the way these problems are written.
  - Think about what is asked for, and what is given.
  - There are two parts to any RR problem statement: the setup, and the “at the moment when” portion. (Some people find it helpful to put a red box around the “at the moment when” part, since you won’t use it until the end of the problem.)
- Draw a diagram — a snapshot of a frozen moment in time. (It may help to draw multiple pictures, depicting multiple stages in time, such as the “Beginning,” “Middle,” and “End.” But at minimum, you should draw the picture for some moment in the “Middle.”)
- Now think about quantities in the picture.
  - When the snapshot “unfreezes,” which quantities in your diagram will change? These need to be labeled with *variables*. (Do *not* label with the values given to you in the “at the moment when” part of the problem!)
  - On the other hand, when the snapshot unfreezes, which quantities will stay the same? You can label these with *numbers* or *constants*.
- Use the diagram to write an equation relating the quantities in your diagram, and then carefully use implicit differentiation (usually with respect to time) to take the derivative.
- In the statement of the problem, which quantities given appear to be rates of change? (Look at units for clues.) These will correspond to derivatives of variables. (Be very careful with the *signs* of derivatives.) You can substitute these rates into your differentiated equation.
- Only now*, make substitutions of the values given in the “at the moment when” portion of the problem. Solve for the (hopefully one) remaining unknown value, which should correspond to the quantity asked for.