

Related Rates Worksheet

EXAMPLE 2 A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft / s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

- a. What rates are mentioned in the problem? Give your answers in English (not in terms of variables)

- b. Which rates from part a are given, and which are unknown?

- c. Is the point of the problem to find an unknown rate? If so, what rate is it?

- d. Define variables to go with the rates. The idea is that each rate is a derivative. Your job is to define what it is the derivative of. Find a variable for each rate. Describe it in words, choose a letter for it, and state what units it is measured in.

- e. Restate the problem using your variables and their derivatives. State what information is given, and what you are supposed to find.

- f. Find one or more equations relating the variables you have defined. The equations should not mention any derivatives, only the variables that are directly defined in part d. If possible draw a diagram that shows all of your variables (not their derivatives). Can you use your diagram to find any equations relating your variables?

- g. Take derivatives of your equations. Can you find a way to solve for the unknown rate in terms of the known rate and the given variable information?

- h. Solve the problem.

Related Rates Worksheet

EXAMPLE 3 A water tank has the shape of an inverted circular cone with base radius 2 m and height 4 m. If water is being pumped into the tank at a rate of $2 \text{ m}^3 / \text{min}$, find the rate at which the water level is rising when the water is 3 m deep.?

- a. What rates are mentioned in the problem? Give your answers in English (not in terms of variables)
- b. Which rates from part a are given, and which are unknown?
- c. Is the point of the problem to find an unknown rate? If so, what rate is it?
- d. Define variables to go with the rates. The idea is that each rate is a derivative. Your job is to define what it is the derivative of. Find a variable for each rate. Describe it in words, choose a letter for it, and state what units it is measured in.
- e. Restate the problem using your variables and their derivatives. State what information is given, and what you are supposed to find.
- f. Find one or more equations relating the variables you have defined. The equations should not mention any derivatives, only the variables that are directly defined in part d. If possible draw a diagram that shows all of your variables (not their derivatives). Can you use your diagram to find any equations relating your variables?
- g. Take derivatives of your equations. Can you find a way to solve for the unknown rate in terms of the known rate and the given variable information?
- h. Solve the problem.