

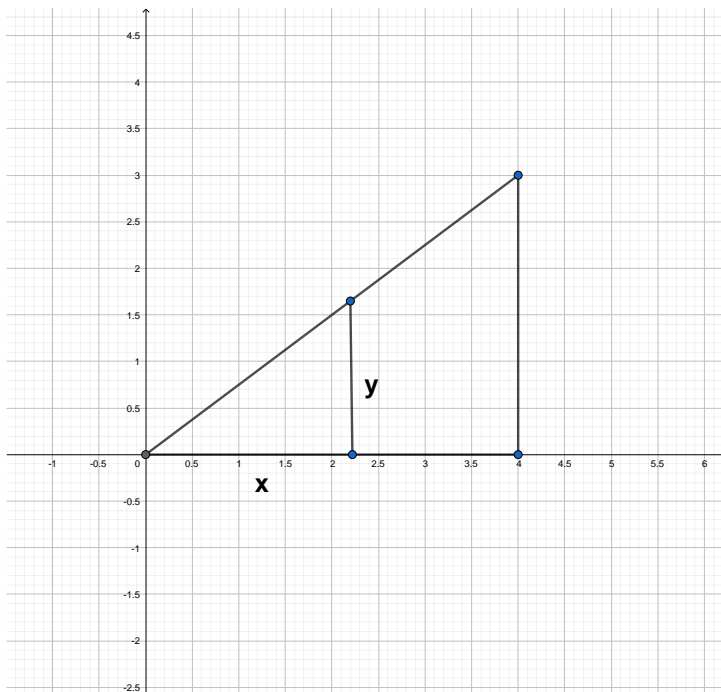
Related Rates (3.10)

These are word problems that involve two or more functions with the same independent variable. Finding a relation between the functions allows us to also find a relation between the corresponding derivatives: hence the name "related rates." The following are some frequently used relations.

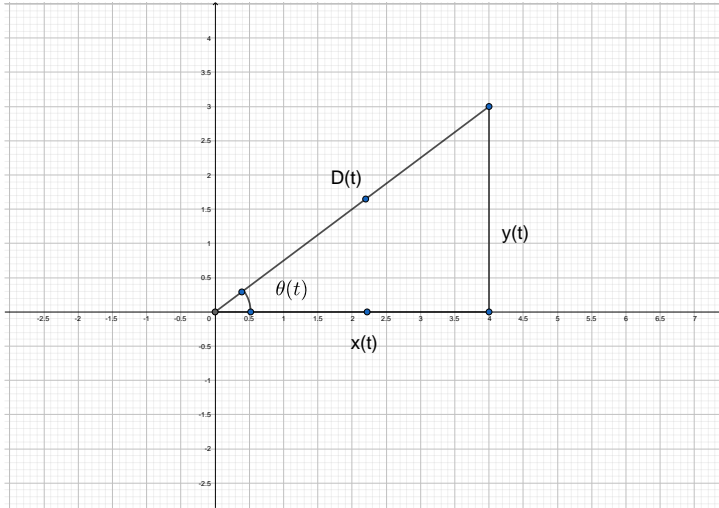
What is the volume for a sphere? If the radius, r , and the volume, V , are functions depending on time, use implicit differentiation to find a relation between the corresponding rates.

What is the volume of a regular circular cone? If the radius, r , the height h , and the volume, V , are functions depending on time, use implicit differentiation to find a relation between the corresponding rates.

Suppose x and y are functions of t , and are related by the following diagram. How are the rates related?



Suppose x , y , θ and D are functions of t , and are related by the following diagram. Use trig functions to give several ways to relate the rates.



Suppose two boats starting 15 kilometers apart and traveling on parallel lines that are 15 kilometers apart move in the opposite direction. One moves at 10 kilometers per hour and the other at 5 kilometers per hour. What is the rate of change of the distance between them after three hours have elapsed?

A light on the ground shines on a wall 12 meters away. A two meter tall man walks from the light toward the wall at 1.6 meters per second. How fast is the man's shadow on the wall changing when he is four meters from the wall?

A ferris wheel with a radius of 10 meters has a constant rate of one rotation every two minutes. How fast is a rider rising when his seat is six meters above the bottom of the wheel?