

Lesson 15

Read 3.9

Related rates

Related rates problems are certain problems where you need to find the derivative of a function

What you need to do to solve the problem:

- ▶ Draw a picture.
- ▶ Identify functions.
- ▶ Write relations among functions.
- ▶ Differentiate the relations.
- ▶ Plug in values.
- ▶ Solve for the derivative that you need.

Useful things to remember

- ▶ Pythagorean theorem.
- ▶ Similar triangles.
- ▶ Trigonometry
- ▶ Law of cosines.
- ▶ Uniform circular motion formulas.
- ▶ Areas formulas.
- ▶ Volume of solids

Similar triangles

Trigonometry

Area/Volume formulas

Area of a trapezoid: $(b + B)\frac{h}{2}$

Volume of a circular cone $V = \frac{1}{3}h\pi r^2$

volume of a pyramid with rectangular base $V = \frac{1}{3}h\pi a.b$

volume of a sphere of radius r $V = \frac{4}{3}\pi r^3$

Law of cosines

Peter is running in a straight line at a constant speed of 7 mi/h. At a certain time he passes in front of a tree distant 0.1 mi from the road. Find the rate at which the distance between Peter and the tree is increasing (with respect to time) when Peter is 1 mi away from the tree.

Suppose an ostrich 5 ft tall is walking at a speed of 4 ft/sec directly towards a street light 10 ft high. How fast is the tip of the ostrich 's shadow moving along the ground ?

Car A is traveling east away from an intersection at 20 mi/h. Car B is traveling North toward the same intersection at 15 mi/h.

At what rate is the distance between the two cars changing when car A is 0.3 mi and car B 0.4 mi from the intersection ?

Immediately afterwards, is the distance between the cars increasing or decreasing ?

A 12 ft ladder is leaning against a wall and the bottom of the ladder is sliding away from the wall at a rate of 3 ft/sec. Find the rate of change of the height of the ladder (with respect to time) at the time when the angle between the ladder and the ground is $\frac{\pi}{3}$.