



## **Problem Set 23: Related Rates**

1. A 13 ft ladder is propped up against the side of a house. The ladder's base is 5 ft away from the house. The top of the ladder is slipping downward at a rate of 1 ft/min. How fast is the base slipping away from the house?

# AP Calculus AB – Unit 4

*Dan the Tutor*



Learn by Doing

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- Two airplanes take off from the same runway. The first plane heads north at a speed of 500 mph. The second plane takes off an hour after the first plane, and it flies east at a speed of 600 mph. At what rate is the distance between the planes changing 4 hours after the first plane departed?



3. The local water tower has a leak, and is spilling out water at a rate of 10 cubic feet per minute. The water tower is in the shape of a cylinder, with a height of 20 ft and a diameter of 10 ft. How fast is the water level falling in the water tower? If the water tower was initially full, how long would it take for all the water to spill out?



4. Coffee drains from a conical (cone-shaped) filter into a coffee pot. The filter has a radius of 3 inches and a height of 6 inches. The filter drains coffee at a rate of  $12 \text{ in}^3/\text{min}$ . How fast is the coffee level in the filter decreasing when there are 4 inches of coffee grounds in the filter?

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5. Gravel is dumped from a dump truck into a conical pile. When the gravel pile has a height of 2 ft, the radius of the pile is 4ft. At the moment the pile is 6 ft high, the height of the pile is increasing at a rate of 1 ft/min. What is the rate at which the dump truck is dumping gravel (in  $\text{ft}^3/\text{min}$ )?