

Related Rates

1. You are driving along a straight highway where the speed limit is 65 miles per hour. You pass a highway patrol car sitting 1000 feet from the highway on your left. Thirty-five seconds later, the highway patrolman checks his radar to see if you are speeding. His radar tells him that the distance between you and him is 3000 feet and that the distance between you and him is increasing at a rate of 95 feet per second. Since 95 feet per second equals approximately 64.77 miles per hour, the highway patrolman decides that you are not speeding. Is the highway patrolman's decision correct? How fast are you actually driving?
2. A hot air balloon rising straight up from a level field is tracked by a range finder 500 feet from the liftoff point. At the moment the range finder's elevation is $\pi/4$, the angle is increasing at the rate of 0.14 radians per minute. How fast is the balloon rising at that moment?
3. A water tank has the shape of an inverted circular cone with base radius 2 meters and height 4 meters. If water is being pumped into the tank at a rate of 2 cubic meters per minute, find the rate at which the water level is rising when the water is 3 meters deep.
4. Scooby Doo and Shaggy are in the woods. Fred told them to look for monsters, but they're really looking for a snack. They come to a clearing, and out of the woods steps a wolfman! Shaggy tries to hide by climbing up a very tall tree at a rate of 4 ft/s. Ten feet from the base of the tree, Scooby tries to hide by digging a hole straight down at a rate of 3 ft/s. At what rate is the distance between Scooby and Shaggy changing after 10 seconds?