

Section 3.10B: More Related Rates.

1. An oil slick is in the shape of a hockey puck (right circular cylinder) and has volume $360\pi \text{ cm}^3$. As time elapses, it is expanding radially at a constant rate of 3 cm/min while its height is shrinking at an unknown variable rate. At what rate is the height changing when the height is 4cm?
2. A man starts walking north at 4ft/s from a point P . Two minutes later, a woman starts walking south at 5 ft/s from a point 500 ft due east of P . At what rate are the people moving apart five mins after the woman starts walking?

At what rate is the distance between the planes decreasing when Plane A is 3 nautical miles from the intersection point and Plane B is 6 nautical miles from the intersection point?

3. A baseball diamond is a square with sides of length 90 ft. A batter hits the ball and runs toward first base at a speed of 23 ft/s.

At what rate is his distance from second base changing when he is halfway to first base? At what rate is his distance from third base changing at the same moment?

4. When air expands adiabatically its pressure P and volume V are related by the equation $PV^{1.4} = C$ where C is a constant. Suppose that a certain instant the volume is 590 cm^3 and the pressure is 75 kPa and is decreasing at a rate of 15 kPa/min. At what rate (in cm^3) is the volume changing at this time?
5. A voltage V across a resistance R generates a current $I = \frac{V}{R}$. If a constant voltage of 21 volts is put across a resistance that is increasing at a rate of 0.6 ohms per second when the resistance is 5 ohms, at what rate is the current changing?
6. A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 1m higher than the bow of the boat. If the rope is pulled in at a rate of 2 m/s, how fast is the boat approaching the dock when it is 7m from the dock?