1. A rock is dropped into a lake and an expanding circular ripple results. When the radius of the ripple is 8 inches, the radius is increasing at a rate of 3 inches per second. At what rate is the area enclosed by the ripple changing at this time?

2. An environmental study of a certain community indicates that there will be

\[ Q(p) = 2p^2 + 6p + 1 \]

units of a harmful pollutant in the air when the population is \( p \) thousand. The population is currently 30,000 and is increasing at a rate of 2,000 per year. At what rate is the level of the air pollution increasing currently?

3. Every day, a flight to Los Angeles flies directly over a man’s home at a constant altitude of 4 miles. If we assume that the plane is flying at a constant speed of 400 miles per hour, at what rate is the angle of elevation of the man’s line of sight changing with respect to time when the horizontal distance between the approaching plane and the man’s location is exactly 3 miles?

4. A person 6 feet tall stands 10 feet from point \( P \), which is directly beneath a lantern hanging 30 feet above the ground. The lantern starts to fall, thus causing the person’s shadow to lengthen. Given that the lantern falls \( 16t^2 \) feet after \( t \) seconds, how fast will the shadow be lengthening exactly 1 second after the lantern has started to fall?

5. The volume of a spherical balloon is increasing at constant rate of 3 in\(^3\)/s. At what rate is the radius of the balloon changing when the radius is 2 in.?

6. At noon, a ship sails due north from a point \( P \) at 8 knots (nautical miles per hour). Another ship, sailing at 12 knots, leaves the same point 1 hour later on a course due east. How fast is the distance between the ships increasing at 2:00 PM?

7. Recall that a baseball diamond is a square of side length 90 ft. The corners of the diamond are labeled, in anti-clockwise order, home plate, first base, second base, and third base. Player A runs from home plate to first base at a speed of 20 ft/s. How fast is the player’s distance from second base changing when the player is halfway to first base?

8. A particle moves along the elliptical path given by \( x^2 + 9y^2 = 13 \) in such a way that when it is at the point \((-2, 1)\), its \( x\)-coordinate is decreasing at the rate of 7 units per second. How fast is the \( y\)-coordinate changing at that instant?