1. Suppose a closed rectangular box is has its length decreasing by 2 inches per second, its width decreasing by 1 inch per second, and its height increasing by 5 inches per second. When the length is 10, the width is 8, and the height is 10, is the box’s volume increasing or decreasing? How fast? At that same instant, is the box’s surface area increasing or decreasing? How fast?

2. Suppose a hot-air balloon is rising vertically above a flat, straight road at a constant rate of 1 foot per second. Just when the balloon is 65 feet above ground, a bicycle moving at a constant rate of 17 feet per second passes under it. Three seconds later, how fast is the distance between the balloon and the bicycle increasing?

3. Suppose an airplane is flying at a constant height of 4 miles. At the instant when the plane is 40 horizontal miles from the airport (i.e. the instant when there are 40 ground miles between the airport and the spot on the ground directly under the plane), a radar at the airport records that the distance between the plane and the airport is decreasing by 240 miles per hour. What is the actual air speed of the plane?

4. Suppose an airplane is flying at a constant height of 4 miles. At the instant when the plane is 72 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 240 miles per hour. What is the actual air speed of the plane?

5. Suppose an airplane is flying at a constant height of 5 miles. At the instant when the plane is 91 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 259 miles per hour. What is the actual air speed of the plane?

6. Suppose an airplane is flying at a constant height of 6 miles. At the instant when the plane is 63 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 191 miles per hour. What is the actual air speed of the plane?

7. Suppose an airplane is flying at a constant height of 4 miles. At the instant when the plane is 20 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 200 miles per hour. What is the actual air speed of the plane?

8. Suppose an airplane is flying at a constant height of 7 miles. At the instant when the plane is 47 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 217 miles per hour. What is the actual air speed of the plane?

9. Suppose an airplane is flying at a constant height of 3 miles. At the instant when the plane is 115 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 116 miles per hour. What is the actual air speed of the plane?

10. Suppose an airplane is flying at a constant height of 8 miles. At the instant when the plane is 37 horizontal miles from the airport, a radar at the airport records that the distance between the plane and the airport is decreasing by 240 miles per hour. What is the actual air speed of the plane?

ANSWERS: 1. volume increasing at 240 cubic inches per second, surface area increasing at 68 square inches per second 2. 11 feet per second 3. 241.2 mph 4. 240.4 mph 5. 259.4 mph 6. 191.9 mph 7. 204.0 mph 8. 219.4 mph 9. 116.04 mph 10. 245.5 mph