Calculus   Worksheet #4   Unit 7   _____

Use calculus to solve each of the following problems. Show all of your work, including an appropriate diagram, and your answer neatly organized.

1. A ship is anchored 2 miles off a straight shore, and its searchlight is following a car that is traveling along the shore at 40 mph. How fast is the searchlight turning when the car is 4 miles from the ship? (Express your final answer in degrees per second rounded to 2 significant digits.)

2. An airplane traveling at 80 meters per second at an altitude of 1500 meters flies directly overhead. How fast is the angle of elevation to the plane changing 5 seconds later? (Express your final answer in degrees per second rounded to three significant digits.)

3. A conical reservoir with its axis vertical is 25 feet deep and 20 feet across the top. If water is being added at the rate of 2 cubic feet per second (ft^3/s), then how fast is the water rising the instant it is 10 feet deep? (Express your final answer in inches per second rounded to 2 significant digits.)

4. A light is on the ground, 30 feet from a wall. A girl who is five feet six inches tall walks from the light toward the wall at 6 fps. How fast is the height of her shadow decreasing when she is 12 feet from the light?

5. A point is moving counter-clockwise around the circle $x^2 + y^2 = 25$ with a constant speed of 3 units per second. How fast is its projection onto the x-axis moving the instant the point passes through the point (3,4)?

6. One leg of a right triangle is 10 cm long and the other leg is 6 cm long. If the length of the longer leg is increasing at the rate of 1.4 cm per second, while the length of the shorter leg is increasing at the rate of 1.2 cm per second, then how fast is the length of the hypotenuse increasing after 10 seconds?

7. A cone has a circular base with a radius of 5 inches and a height of 3 inches. If the height is increasing at .5 inches per second, while the radius of the base remains constant, then how fast is the volume increasing after 4 seconds?