

MATH 141 WORKSHEET 6

Show all work for full credit.

1. A ship is 400 miles directly south of Tahiti and is sailing south at 20 mph. Another ship is 300 miles east of Tahiti and is sailing west at 15 mph. At what rate is the distance between the ships changing? Give units. Are the ships getting closer to one another or farther away?

2. A spherical balloon is inflated with helium at the rate of 100π in³/min. How fast is the balloon's radius increasing at the instant when the radius is 4 in? Give units. (The volume of a sphere is $V = \frac{4}{3}\pi r^3$.)

2

3. The dimensions of a box are 10 in, 12 in, and 16 in. If the shorter sides are decreasing at a rate of 0.2 inches per minute, and the longest side is increasing at a rate of 0.3 inches per minute, how fast is the volume changing? Give units. Is the volume increasing or decreasing?

4. A man 6 ft tall walks toward a light 16 ft above the ground at a rate of 5 feet per second. How fast is his shadow changing in length? Give units. Is his shadow getting shorter or longer? (Hint: Think similar triangles.)

5. Two taxicabs begin at the same time at the intersection of Park Ave and 59th St. One taxicab heads uptown (North) on Park Ave at 40 mph. The other heads west on 59th St at 30 mph. Both have the unbelievable good fortune not to be stopped by traffic lights or slowed down by traffic. When the taxicab on Park Ave has gone half a mile, how fast is the distance (as the crow flies) between them increasing? Give units.

6. A solution drains through a filter funnel at a rate of 10 cc per minute. The height of the funnel is 10 cm, and the diameter of its circular opening is 12 cm. How fast is the solution level dropping when there are 15π cc left in the funnel? Give units. (The volume of a cone is $V = \frac{1}{3}\pi r^2 h$.)