Calculus
Related Rates Practice   Name _____
Mrs. Schempp   Period _____ Date _____

1. A 25 foot long ladder is leaning against a vertical wall. If the bottom of the ladder is pulled horizontally away from the wall at 3 feet/sec, how fast is the top of the ladder sliding down the wall when the bottom is 15 feet from the wall? (Answer: 2 ¼ ft/sec)

2. A tank is in the form of an inverted cone with an altitude of 16 m and a radius of 4 m. Water is flowing into the tank at a rate of 2 cubic meters/min. How fast is the water level rising when the water is 5 m deep? (Answer: 32/25π m/min)

3. Suppose in a certain market that x thousands of crates of oranges are supplied daily when p dollars is the price per crate, and the supply equation is $px - 20p - 3x + 105 = 0$. If the daily supply is decreasing at the rate of 250 crates per day, at what rate is the price changing when the daily supply is 5000 creates? (Answer: −$0.05 per day)

4. An airplane is flying west at 500 ft/sec at an altitude of 4000 ft and a searchlight on the ground lies directly under the path of the plane. If the light is to be kept on the plane, how fast is the searchlight revolving when the airline distance of the plane from the searchlight is 2000 ft due east? (Answer: 1/10 radian/sec) (Hint: The 2000 ft is a horizontal distance that the airplane will travel.)

5. A kite is flying at a height of 40 ft. A child is flying it so that it is moving horizontally at a rate of 3 ft/sec. If the string is taut, at what rate is the string being paid out when the length of the string released is 50 ft? (Answer: 9/5 ft/sec)

6. A spherical snowball is being made so that its volume is increasing at the rate of 8 cubic feet/min. Find the rate at which the radius is increasing when the snowball is 4 feet in diameter. (Answer: 1/2π ft/min.)

7. Sand is being dropped at the rate of 10 cubic meters/min onto a conical pile. If the height of the pile is always twice the base radius, at what rate is the height increasing when the pile is 8 m high? (Answer: 5/8π m/min.)

8. A man 6 feet tall is walking toward a building at the rate of 5 ft/sec. If there is a light on the ground 50 feet from the building, how fast is the man's shadow on the building growing shorter when he is 30 feet from the building? (Answer: 15/4 ft/sec)

9. A water tank in the form of an inverted cone is being emptied at the rate of 6 cubic meters/min. The altitude of the cone is 24 m, and the radius is 12 m. Find how fast the water level is decreasing when the water is 10 m deep. (Answer: 6/25π m/min)

10. A trough is 12 feet long and its ends are in the form of inverted isosceles triangles having an altitude of 3 feet and a bas eof 3 feet. Water is flowing into the trough at the rate of 2 cubic feet/min. How fast is the water level rising when the water is 1 foot deep? (Answer: 1/6 ft/min)

11. Boyle's law for the expansion of gas is PV=C, where P is the number of pounds per square unit of pressure, V is the number of cubic units of volume of gas, and C is a constant. At a certain instant the pressure is 3000 lb/sq ft, the volume is 5 cubic ft, and the volume is increasing at the rate of 3 cubic ft/min. Find the rate of change of pressure at this instant. (Answer: -1800 lb/sq ft per min)

12. A stone is dropped into a still pond. Concentric circular ripples spread out, and the radius of the disturbed region is increased a the rate of 16 cn/sec. At what rate does the area of the disturbed region increase when its radius is 4 cm? (Answer: 128π cm²/sec)

13. A rope is attached to a boat at water level, and a woman on a dock is pulling on the rope at the rate of 50 ft/min. If her hands are 16 feet above the water level, how fast is the boat approaching the dock when the amount of rope out is 20 feet? (Answer: 250/3 ft/min)

14. A ladder 7 m long is leaning against a wall. If the bottom of the ladder is pushed horizontally toward the wall at 1.5 m/sec, how fast is the top of the ladder sliding up the wall when the bottom is 2 m from the wall? (Answer: $\sqrt{5}/5$ m/sec)

15. If a ladder of length 30 ft that is leaning against a wall has its upper end sliding down the wall at the rate of ½ ft/sec, what is the rate of change of the measure of the acute angle made by the ladder with the ground when the upper end is 18 ft above the ground? (Answer: 1/48 rad/sec)

16. A six-foot tall man is walking away from a building at the rate of 4 ft/sec. If there is a light on the ground 40 feet from the building, how fast is the man's shadow on the building growing larger when he is 30 feet from the building? (Answer: 48/5 ft/sec)

17. A burn on a person's skin is in the shape of a circle. If the radius of the burn is decreasing at a rate of 0.05 cm per day when it is 1 cm, what is the rate of decrease of the area of the burn at that instant? (Answer: $\pi/10$ cm²/day)