Calculus

7 Related Rates Problems

(Q1.) When a circular metal plate is heated in an oven, its radius increases at the rate of 0.02 cm/min. At what rate is the plate's area increasing when the radius is 60 cm?

(Q2.) A water tank has the shape of an inverted (meaning up-side down) circular cone with base radius 2 m and height 4 m. If water is being pumped into the tank at a rate of 2 m^3/min, find the rate at which the water level is rising when the water is 3 m deep.

(Q3.) A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

(Q4.) Car A is traveling west at 50 mi/h and car B is traveling north at 60 mi/h. Both are headed for the intersection of the two roads. At what rate are the cars approaching each other when car A is 0.3 mi and car B is 0.4 mi from the intersection?

(Q5.) At noon, ship A is 100 km west of ship B. Ship A is sailing south at 40 km/h and ship B is sailing north at 20 km/h. How fast is the distance between the ships changing at 4:00 PM? (Round your answer to one decimal place.)

(Q6.) Two sides of a triangle (not necessary a right triangle) are 5 m and 8 m in length and the angle between them is increasing at a rate of 0.06 rad/s. Find the rate at which the area of the triangle is increasing when the angle between the sides of fixed length is $\frac{\pi}{3}$ rad?

(Q7.) A balloon leaves the ground 500 feet away from an observer and rises vertically at the rate of 140 ft/min. At what rate is the angle of inclination of the observer's line of sight increasing at the instant when the balloon is exactly 500 ft above the ground?

[Answers]

(Q1.) "increasing" at the rate of 2.4π cm^2/s

(Q2.)"Rising" at the rate of $\frac{8}{9\pi}$ m/min

(Q3.) "sliding down" at the rate of $\frac{3}{4}$ ft/s

(Q4.) "approaching" each other at the rate of 78 mi/h

(Q5.) "Increasing" at the rate of 55.4 km/h

(Q6.) "Increasing" at the rate of $\frac{3}{5}$ m^2 /s

(Q7.) "increasing" at the rate of $\frac{7}{50}$ ft/s