

Even More Optimization and Related Rates

Directions: Do the problems.

1. An open top box is constructed by cutting congruent squares from the corners of a 14x30 inch rectangular piece of cardboard and then folding the flaps up. What size squares should be cut from the corners to create the box of maximum volume.
2. What point on the graph of $y = \sqrt{x}$ is closest to the point (7,0)?
3. Two vertical poles, one 16 feet high and one 24 feet high are placed 30 feet apart on a flat field. A rope is to be strung from the top of each pole and staked to a point between the two poles. If the two ropes must be staked at the same point, how far from the 16 foot high pole should the stake be placed to minimize the amount of rope needed?
4. Water leaking onto a floor forms a circular pool. The radius of the pool increases at 4 cm/minute. How fast is the area of the pool increasing when the radius is 5 cm?
5. Oil spilling from a ruptured tanker spreads in a circle on the surface of the ocean. The area of the spill increases at a rate of 9π meters²/minute. How fast is the radius of the spill increasing when the radius is 10 meters.
6. A conical paper cup is 10 cm tall with a radius of 10 cm. The cup is being filled with water so that the water level rises at a rate of 2 cm/second. At what rate is water being poured into the cup when the water level is 8 cm?
7. A 7 feet tall person is walking away from a 20 feet tall lamppost that is vertically oriented on flat ground at a rate of 5 ft/second. At what rate is the length of the person's shadow changing when the person is 16 feet from the lamppost?