1. Our old friend Happy is pulling a boat into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 1 m higher than the bow of the boat. If the rope is pulled in at a rate of 1 m/s, how fast is the boat approaching the dock when it is 8 m from the dock?



2. If the rocket shown below is rising vertically at 880 ft/s when it is 4000 ft up, how fast is the angle of elevation changing at that instant?



3. A low-flying jet aircraft covering a straight course is tracked by a radar station set 6 miles to one side of the flight path. A radar unit can measure only the "range" to an object and how fast that object is moving away from (or toward) the radar unit. Suppose the radar reports an airplane traveling at a speed of 800 mph at a range of 10 miles. What is the actual speed of the aircraft?



4. Gravel is being dumped from a conveyor belt at a rate of 30 ft³/min and its coarseness is such that it forms a pile in the shape of a cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 ft high?

5. The beacon of a lighthouse 1 km from a straight shore revolves 5 times per minute and shines a spot of light on the shore (see figure below). How fast is the spot of light moving when $\theta = 45^{\circ}$? What happens to the velocity of the spot of light as θ approaches 90°?



6. A flood lamp is installed on the ground 200 feet from a vertical wall. A six foot tall man is walking towards the wall at the rate of 30 feet per second. How fast is the tip of his shadow moving down the wall when he is 50 feet from the wall?



7. When the price of a certain commodity is p dollars per unit, customers demand x hundred units of the commodity, where

 $10px^2 - x^3 + 5p^4 = 6480.$

How fast is the demand x changing with respect to time when the price is \$6 per unit and is decreasing at a rate of 36 cents per month ?