

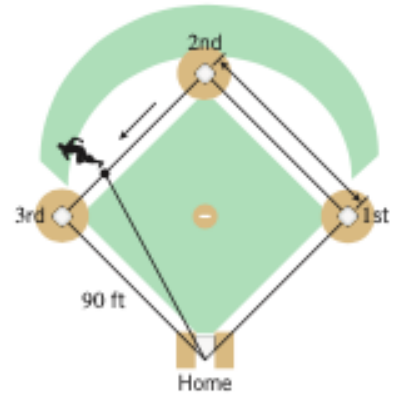
Related Rates

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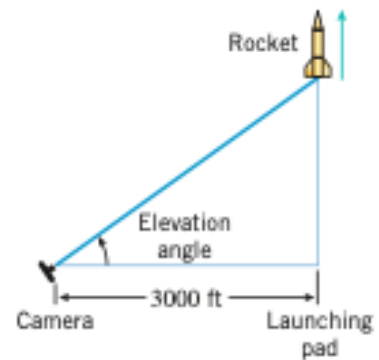
I.

A baseball diamond is a square whose sides are 90 ft long. Suppose that a player running from second base to third base has a speed of 30 ft/s at the instant when he is 20 ft from third base. At what rate is the player's distance from home plate changing at that instant?



II.

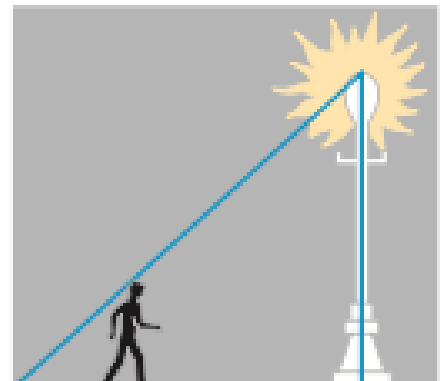
We have shown a camera mounted at a point 3000 ft from the base of a rocket launching pad. If the rocket is rising vertically at 880 ft/s when it is 4000 ft above the launching pad, how fast must the camera elevation angle change at that instant to keep the camera aimed at the rocket?



III.

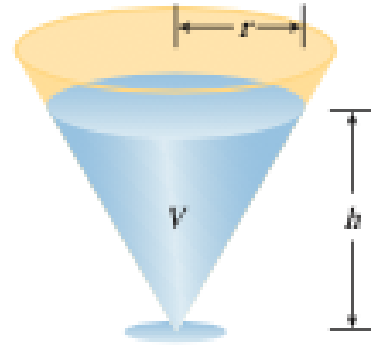
A man 6 ft tall is walking at the rate of 3 ft/s toward a streetlight 18 ft high, see figure below.

- At what rate is his shadow length changing?
- At what rate is the tip of his shadow moving?



IV.

A liquid is draining at a rate of $3 \text{ cm}^3/\text{min}$ from a cone filter with radius 4 cm and height 12 cm . Find the rate at which the height of the liquid in the cone is changing when there is 10 cm^3 liquid left. Note that the volume of liquid is given by $V = \frac{\pi}{3}r^2h$.



V.

A boat is pulled into a dock by means of a rope attached to a pulley on the dock. The rope is attached to the bow of the boat at a point 10 ft below the pulley. If the rope is pulled through the pulley at a rate of $20 \text{ ft}/\text{min}$, at what rate will the boat be approaching the dock when 125 ft of rope is out?

