

1. A girl who is 5 feet tall is walking at the rate of 4 miles per hour away from a street light which is 9 feet high. How fast is the **length** (not the tip as in the problem done in class) of her shadow changing when she is 25 feet from the street light?

2. A train rounding a bend shaped like the parabola with equation $y = 1 - x^2$, (with units in miles), has a horizontal speed of $\frac{dx}{dt} = 20$ miles per hour.

(a) What is its vertical speed, $\frac{dy}{dt}$, at $(0, 1)$?

(b) What is its vertical speed at $(1, 0)$?

3. Sand is being poured in a conical pile of height and radius x at the rate of 3π cubic feet per minute. How fast is the height increasing when the volume is 9π cubic feet? Note the volume of such a cone is given by $\frac{1}{3}\pi x^3$.