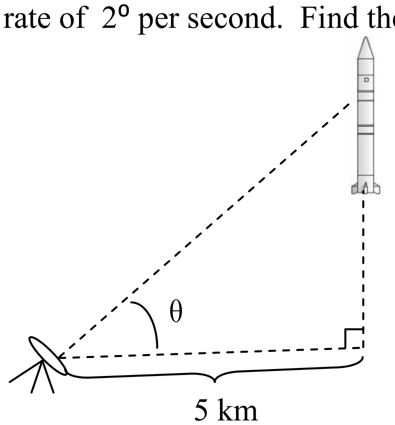
SI Session: March, 10^{th} & 12^{th}, 2009
Tuesdays: 3:30 PM – 5:00 PM
Thursdays: 1:30 PM – 3:00 PM
& 3:30 PM – 5:00 PM
Room 1245 SNAD

Prof. Stockton : Calculus I
Spring 2009
SI Leader : Neil Jody

[1] A man 6 ft tall is walking at a rate of 3 ft/s toward a streetlight 18 ft high. (a) At what rate is his shadow length changing? (b) How fast is the tip of his shadow moving?

[2] A missile is fired vertically from a point which is 5 kilometers from a tracking station and at the same elevation (see figure). For the first 20 seconds of flight its angle of elevation θ changes at a constant rate of 2° per second. Find the velocity of the missile 15 seconds after launching.



[3] The area of an equilateral triangle is decreasing at a rate of $4\,cm^2$/min. Find the rate at which the length of a side is changing when the area of the triangle is $200\,cm^2$.

[4]] For the following find the derivative and critical values of *f*.

(a) $f(x) = x - \sin(x)$

(b) $f(x) = \dfrac{3x}{\sqrt{4x^2 + 1}}$

(c) $f(x) = \sqrt{x^2 - 3x - 10}$

(d) $f(x) = \dfrac{x^2 - 9}{(x+1)^2}$

(e) $f(x) = \sin^2(x) + \cos(x)$

(f) $f(x) = \sin^2(x)$

(g) $f(x) = x - x^{2/3}$

[5] If $x = \tan y$, calculate $\frac{d^2y}{dx^2}$.

[6] Find the absolute maximum and minimum values of $f(x) = x - 3x^{2/3} + 4$ on the interval $\left[-8, \frac{125}{8}\right]$.

[7] Find the absolute extrema of the function $f(x) = \frac{1}{2}\cos 2x + \sqrt{3}\sin x$ on the interval $[0, \pi]$.

[8] Find the open intervals on which $g(x) = \frac{x^4 + 1}{x^2}$ is increasing or decreasing, and find the relative extrema.

[9] Fill in the blank: if *f* is continuous on $[-1,3]$ and differentiable on $(-1,3)$ and if $f(-1) = 5$ and $f(3) = 15$, then the *Mean Value Theorem* guarantees the existence of a number *c* between –1 and 3 such that $f'(c) =$ ____________________ .

[10] Determine if the function $f(x) = x - \sqrt[3]{x}$ satisfies the hypotheses of the Mean Value Theorem on the interval $[-8,1]$.