MATH 111-107 RECITATION 1013

Warm-up

Problem 1. Evaluate the following items:

(1) $5^{\log_5 100}$.
(2) $5^{2\log_5 100}$.
(3) $\log_5 25$.
(4) $\log_4 \frac{1}{16}$.
(5) $\log_4 2 + \log_4 32$.
(6) $\frac{\log_3 25}{\log_3 5}$.

Problem 2. Find the domain and then derivative of the following functions on their respective domain:

(1) $\ln(\sec(x))$.
(2) $(\ln(5x))^3$.

Problem 3. A big block of ice is in the shape of a perfect cube. As it melts, each edge of the cube is decreasing at the rate of 2 cm/min. Suppose you observe that the edge of the ice cube is 80 cm, at what rate is the ice cube's

(1) surface area changing?
(2) volume changing?

Problem 4. Consider an isosceles triangle with base length 10 inches and side length x inches. The side length is increasing at a rate of 4 inches/min. When the side length is 13 inches, at what rate is the triangle's

(1) perimeter changing?
(2) height changing?
(3) area changing?

Problem 5. An open hemispherical tank has radius 13 feet. Oil begins flowing into the tank in such a way that the depth h of the oil in the tank changes at the rate of 3 ft/hr. At what rate is the top circular surface area of the oil changing when the depth of oil is

(1) $h = 1$ ft?
(2) $h = 8$ ft?
(3) Which one is bigger? Does it surprise you or does it make sense?

Problem 6. (A sliding ladder) A ladder of constant length L is leaning against the wall. Its base is sliding away from the wall at some rate c ft/min. Find the rate at which the tip of the ladder is sliding down the wall when it hits the ground.

Problem. (Bonus) Is the previous problem physically sound? If so, does the result make sense? If not, what assumption did we implicitly make to make the problem "work"? What really should happen when something is sliding down the wall?