

Ms. Nguyen Calculus 101A  
Sample Test Chapter 3

1. Let  $f(x) = x^3 - 3x + 3$  (5 pts. ea.)
  - a) Find the **critical point(s)**.
  - b) Find the intervals of increase or decrease.
  - c) Find all local extrema.
  - d) Find the open intervals on which the graph is concave up or down.
  - e) Find the point(s) of inflection.
  - f) Sketch the graph.
  
2. For  $f(x) = x^3 - 12x - 5$ , use the Second Derivative Test to locate the local extrema. (6 pts.)
  
3. The management of a large store has 1600 feet of fencing to fence in a rectangular storage yard using the building as one side of the yard. If the fencing is used for the remaining 3 sides, find the area of the largest possible yard. (10 pts.)
  
4. There are 60 orange trees in an orchard. Each tree produces 800 oranges. For each additional tree planted in the orchard, the output per tree drops by 10 oranges. How many trees should be added to the existing orchard in order to maximize the total output of trees (10 pts.)
  
5. An 8 foot long ladder is leaning against a wall. The top of the ladder is sliding down the wall at the rate of 2 feet per second. How fast is the bottom of the ladder moving along the ground at the point in time when the bottom of the ladder is 4 feet from the wall? (10 pts.)
  
6. A woman standing on a cliff is watching a motorboat through a telescope as the boat approached the shoreline directly below her. If the telescope is 250 feet above the water level and if the boat is approaching at 20 feet per second, at what rate is the angle of the telescope changing when the boat is 250 feet from the shore? (10 pts.)
  
7. Find the following limits. (6 pts. Ea)
  - a.  $\lim_{x \rightarrow \infty} \frac{x - 2x^2}{3x^2 + 5}$
  - b.  $\lim_{x \rightarrow 0} \frac{x - \sin x}{x^3}$
  - c.  $\lim_{x \rightarrow \infty} \left( \frac{x}{x+1} \right)^x$
  - d.  $\lim_{x \rightarrow \infty} x^{-5} \ln x$