

This is a take home quiz. It is due at the beginning of class on Monday. No late submissions will be accepted. (Yes, this means that you will need to be on time on Monday.) Work neatly, show all steps and staple your assignment. Remember, standards are higher with take-home quizzes.

**For full credit, show all steps, using correct notation. Unless otherwise indicated, present the exact value of all answers.**

1. (2 points) State the least upper bound property. Be precise.
2. (7 points) State and prove the Mean Value Theorem. Use correct notation and be precise.
3. (3 points each) Differentiate each of the following. Simplify your answer.
  - a)  $f(x) = \frac{x^2 + 1}{\log_3 x}$
  - b)  $g(x) = \tan x$
4. (5 points) Find all values of  $c$  that satisfy the conclusion of the Mean Value Theorem for  $f(x) = x^3 - 3x^2 + 4x$  on  $[-2, 1]$ .
5. (5 points) We are designing a poster to contain  $50 \text{ in}^2$  of printing with a 4-inch wide margin at the top and bottom and a 2-inch wide margin at each side. What overall dimensions will minimize the amount of paper used?
6. (5 points) Find two positive numbers  $a$  and  $b$  whose product is 2 and the sum of the square of one and the cube of the other is smallest possible.