University of California, Riverside
Department of Mathematics

Midterm 2

Mathematics 8B - First Year of Calculus
Sample 3

Instructions: This exam has a total of 100 points. You have 50 minutes. You must show all your work to receive full credit You may use any result done in class. The points attached to each problem are indicated beside the problem. You are not allowed books, notes, or calculators. Answers should be written as $\sqrt{2}$ as opposed to 1.4142135....

Show all your calculations in detail. Explain and justify every step.

1. (20 points) State the squeeze theorem and use it to evaluate $\lim_{x\to 0} x^4 \cos(\frac{x^2+1}{x^3})$.
2. (20 points) Using the definition of limits, prove that $\lim_{x\to 2}(3x+1) = 7$.
3. (20 points) Show that the equation $x^5 + 4x - 7 = 0$ has a root between 1 and 2 using the Intermediate Value Theorem.
4. (20 points) Use the differentiation rules to find the derivative of $g(x) = (\sqrt{x} + \frac{1}{\sqrt{x}})\tan(x)$.
5. Given the function $f(x) = x^2 + 3x$,
   (a) (10 points) Find $f'(x)$ using the definition of the derivative of a function. (Do not use the differentiation formulas.)
   (b) (10 points) Find the equation of the tangent line to $y = f(x)$ at the point $(1, 4)$.