Mathematics 115 Name: _____
Professor Alan H. Stein
Due Friday, February 9, 2007 This problem set is worth 50 points.

Make sure that you check the course website for instructions, fill out the pledge form and hand it in with your paper. The instructions for problem sets and take-home examinations along with the pledge form are available from the *General Policies* portion of the web site. *No paper will be accepted without a signed pledge form.* Remember that your paper may be handed in before the deadline but that no late papers will be accepted regardless of the reason. The course website also includes an explanation of how your average will be calculated if you fail to complete this assignment.

Note that, since most of the calculations involved can be done routinely using either a calculator or a symbolic manipulation program such as Maple or Mathematica, it will obviously be necessary to show, through your work, exactly how you came up with your solutions.

(1-8) Let $f(x) = \begin{cases} x^2 & \text{for } x < 0 \\ 1 & \text{for } x = 0 \\ \dfrac{x^2 + x - 42}{x - 6} & \text{for } 0 < x < 10 \\ \dfrac{5x^2 + 3x - 1}{x^2 - 144} & \text{for } x > 10. \end{cases}$

Find the limits indicated. If a limit doesn't exist, show why.

1. $\lim_{x \to -5} f(x)$
2. $\lim_{x \to 0} f(x)$
3. $\lim_{x \to 0^-} f(x)$
4. $\lim_{x \to 0^+} f(x)$
5. $\lim_{x \to 6} f(x)$
6. $\lim_{x \to 12^-} f(x)$
7. $\lim_{x \to 12^+} f(x)$
8. $\lim_{x \to \infty} f(x)$

9. Find $\lim_{x\to 8} \dfrac{\dfrac{1}{x+2} - \dfrac{1}{10}}{x-8}$.

10. Find $\lim_{x\to 5} \dfrac{\sqrt{x+4}-3}{x-5}$.

11. Find $\lim_{x\to 5} \dfrac{|x-10|-5}{x-5}$.

12. Find some $\delta > 0$ such that $|f(x) - 19| < .01$ when $|x-3| < \delta$, where $f(x) = 4x + 7$.

13. Use the Bisection Method, starting with the interval $[0, 1]$, to find an interval of width no greater than 0.1 which contains a zero of the polynomial $x^5 + x^2 - 1$.