TEST #3, MA 125, FALL 2001

Please give your answers in the space provided and use the back of this sheet for the graph.

1 (12 pts) Find the critical numbers of the function $F(x) = (x^2 - x)^{1/3}$. Keep in mind that the critical numbers are the points at which the derivative equals zero or does not exist.

2 (12 pts) Find the absolute minimum and maximum of the function $f(x) = \frac{\ln x}{x}$ on the interval $[1, 3]$

3 (20 pts) Find intervals of increase or decrease, local maxima/minima, intervals of concavity and inflection points of the function $f(x) = \ln(1 + x^2)$. Use this information to sketch the graph of $f(x)$.

4 (20 pts) A rain gutter is constructed from a metal sheet of width 30cm by bending up one-third of the sheet on each side through an angle θ. How should θ be chosen so that the gutter will carry the maximum amount of water?

5 (12 pts) Find the most general antiderivative of the function $f(x) = 3e^x + \cos x - 3 \sin x$

6 (12 pts) Find the most general antiderivative of the function $f(x) = \frac{x^3+x^2+x+1}{x}$

7 (12 pts) Find f if it is known that $f''(x) = x^2 - 1, f'(0) = 3, f(1) = 7$