Math 1A Midterm 1. 2004-9-30 2:00pm-3:30pm

You are allowed 1 sheet of notes. Calculators are not allowed. Each question is worth 1 mark, which will be given only for a clear correct answer and correct working. There is no partial credit for wrong answers. There are questions on both sides of the paper.

1. Find the domain of the function $f(x) = \sqrt{x-4}$.

2. Sketch the graph of $y = |x^2 - 1|$.

3. Find a formula for the inverse of the function $y = \exp(\sqrt{x})$.

4. Determine the infinite limit ($+\infty$ or $-\infty$) of

$$\lim_{x \to 0} \frac{x+1}{x^2(x-1)}.$$

5. Evaluate the limit

$$\lim_{x \to -1} \frac{x^2 - x - 2}{x+1}.$$

6. Find the constant c that makes f continuous for all reals, where $g(x) = x^2 - c^2$ if $x < 4$, $g(x) = cx + 20$ if $x \geq 4$.

7. Find the numbers at which f is discontinuous, where f is defined by $f(x) = x + 1$ if $x < 0$, $f(x) = e^x$ if $0 \leq x \leq 1$, $f(x) = 2 - x$ if $x > 1$.

8. Evaluate

$$\lim_{x \to +\infty} \frac{4x^2 - 3}{x^2 - x + 10}.$$

9. Find the equation of the tangent line to the curve $y = x^3$ at the point where $x = 1$.

10. Sketch the graph of a function for which $f(0) = 0$, $f'(0) = -1$, $f(1) = 0$, $f'(1) = -1$.

11. Determine for what values of x the function $f(x) = x|x|$ is differentiable and find a formula for f'.

12. Differentiate the function $y = 6x^{-8/3}$.

13. Find all points on the curve $y = x^3 + 3x^2 + 3x + 1$ where the tangent is horizontal.

14. Differentiate $(x^3 + 1)e^x$.

15. Differentiate

$$\frac{e^x - 1}{e^x + 1}.$$