MA 125-5B, Spring 2004

TEST # 2

March 1, 2004 (70 minutes)

Name: SSN:

Max. Points: 100 + 10 Bonus Points: Test Grade:

Turn in **all the work** which you did to solve the problems, not just the final answer. In particular, include **intermediate steps in calculations**, wherever they are needed. You may write on the back of a page if you need extra space.

No book, no notes, and no calculator are to be used!

1. Find $f'(x)$ for the following functions ($5 \times 5 + 5^*$P):

(a) $f(x) = 2x^3 - \dfrac{1}{\sqrt{x}} + 2^x$

(b) $f(x) = x\cos(3x)$

(c) $f(x) = \tan^{-1}(\sqrt{x})$

(e) $f(x) = \sqrt{\tan(2x+1)}$

(d) $f(x) = \dfrac{(x+1)\sqrt{x}e^x}{3x-2}$

(f)* $f(x) = x^{\cos x}$

2. Suppose that $g(1) = 2$, $g'(1) = -3$ and $f(x) = \dfrac{g(x)}{x^2}$. Find $f'(1)$. (10P)

3. Let $f(x) = \sin x$. Find $f^{(98)}(x)$. (10P)

4.* Use the formula for the derivative of a^x and implicit differentiation to derive a formula for the derivative of $\log_a x$. Include explanations for all steps of your argument. (5P*)

5. Find an equation for the tangent line to the curve $y = \dfrac{x^2 + x + 1}{x - 1}$ at the point $(2, 7)$. (15P)

6. Find an equation for the tangent line to the curve $xy^3 - x^2y = 0$ at the point $(1, 1)$. (15P)

7. For the graph of the function $f(x) = \ln(x^2 + 1)$, find (15P)

(a) points with horizontal tangents,

(b) inflection points.

8. For which values of x is the function $f(x) = xe^{-x}$ increasing? (10P)