Math 106-Sec 55X Fall '08 **Exam 3** **Score:** _____

Name: _____ **TA's Name:** _____

page	1	2	3	4	total
score					

Instructions: You must show supporting work as much as possible to receive full and partial credits. No text book, notes, formula sheets allowed.

1(28pts) Evaluate the following integrals. (Decimal approximations such as 0.1234 will not get credit.)

(a) $\int_0^1 \frac{x}{x^2+1} dx$

(b) $\int \frac{2\arctan x}{x^2+1} dx$

(c) $\int_0^2 (t^2+2t+2)^3(t+1)dt$

(d) $\int \sqrt{\frac{x-1}{x^5}} dx$

(*Continue on Next Page ...*)

2(14pts) Evaluate the following limits: (If you use the L'Hôpital rule, make sure to justify its use.)

(a) $\lim_{x\to\infty} x^2 e^{-x}$

(b) $\lim_{x\to 0} \dfrac{x^2}{\cos(2x) - 1}$

3(15pts) Given the following information about two functions f and g: $\int_1^3 f(x)dx = 1$, $\int_1^2 f(x)dx = 2$, $\int_1^2 g(x)dx = -2$, find the exact value of each of the following.

(a) $\int_1^2 [3f(x) - 5g(x)]dx$

(b) $\int_2^3 3f(x)dx$

(c) The average value of f on the interval $[1, 3]$.

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4(15pts) (6 points each) Find the followings:

(a) $F'(x)$ if $F(x) = \int_1^{1/x} \ln s \, ds$

(b) $f(x)$ if $f'(x) = \frac{1}{x+1} + 2\sin x$ and $f(0) = 2$.

(c) The right point Riemann sum R_4 of the function $f(x) = 2x$ in in the interval $[0, 4]$ with the regular partition of $n = 4$ subintervals.

5(12pts) Find, **but do not evaluate**, a definite integral which represents the area of the region between two curves: $y = 3x$ and $y = 4 - x^2$. Make sure to sketch the region.

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6(16pts) An open rectangular box (tray) is to be made from a 30-cm-by-16-cm aluminum sheet by cutting congruent squares from the corners and folding up the sides. What are the dimensions of the box of the largest volume, and what is the volume?

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2 Bonus Points: Your professor Bo is currently pre-occupied with three numbers. They are: ____, ____, and _____ (Warning: infinity, ∞, is not a number.) (*... The End*)