

Name: _____

Professor: A.Alexandrou Himonas

**Mathematics 166
Honors Calculus 2
Spring Semester, 1992
Exam 1
February 17, 1992**

This Examination contains five problems worth a total of 100 points, each problem worth 20 points, on (7) sheets of paper including the front cover and one extra sheet on the back. Do all your work in this booklet and show your computations. Calculators, books and notes are not allowed.

1	
2	
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Total	

Sign the pledge: “On my honor, I have neither given nor received unauthorized aid on this Exam”:

GOOD LUCK

1. Evaluate each of the following integrals.

a) $\int x e^{x^2} dx =$

b) $\int \sin 2x \cos 2x dx =$

c) $\int x(x - 1) dx =$

d) $\int \sin(\cos 2x) \sin 2x dx =$

e) $\int_0^{1/4} \sqrt{1 - 4x^2} dx =$

f) $\int (3x^2 + 6x^3 + 6x + 5) dx =$

g) $\int (\sqrt{x} + 2\sqrt{x}) dx =$

h) $\int_0^{\pi^2} \sin \sqrt{x} \sqrt{x} dx =$

2. Use the reduction formula

$$\int 1(x^2 + 1)^n dx = 12n - 2x(x^2 + 1)^{n-1} + 2n - 32n - 2 \int 1(x^2 + 1)^{n-1} dx$$

(if you wish) to compute the integral

$$I = \int 2x + 3(x^2 + 2x + 5)^2 dx.$$

3.) Compute the improper integral

$$I = \int_1^{\infty} 1x^4 + x^2 dx.$$

4.) Find the solutions to the following initial value problem:

$$y' - 4x^3y = x^3, \quad y(0) = -1.$$

5.) Show that

$$\int x^n e^{-x} dx = -x^n e^{-x} + n \int x^{n-1} e^{-x} dx$$

and then use it to show the following beautiful formula:

$$\int_0^{\infty} x^n e^{-x} dx = n!.$$