MA 1022 B 2011 **Final Exam** **Name** _____

Instructions

This test is closed book. Calculators are not allowed.

Part I - Basic Skills

Problem	1	2	3	4	5	6	7	Total
Value	5	5	5	5	5	5	5	35
Earned								

Part II

Problem	8	9	10	11	12	13	Total
Value	16	16	16	12	24	16	100
Earned							

Please Circle your Section

B01 Berezovski, M (8:00) B02 Su, L (9:00) B03 Tashjian, G (9:00)

B04 Malone, JJ (10:00) B05 Christopher, P (10:00) B06 Su, L (1:00)

B07 Berezovski, M (1:00) B08 Abraham, J (2:00) B09 Lopez Garcia, F (3:00)

B11 Tashjian, G (2:00)

Part I - Basic Skills

Evaluate the following integrals and write your answers in the space provided. Use the scratch paper provided for your work. You need not simplify your answers. No partial credit will be given for these problems. Work carefully and check your work.

1. $\int_1^4 \left(3x^2 - x^{-2} + \frac{3}{2}\sqrt{x}\right) dx$ Ans. _____

2. $\int \tan^3(x) \cdot \sec^2(x)\, dx$ Ans. _____

3. $\int_0^{\pi/2} \cos(x) e^{\sin(x)}\, dx$ Ans. _____

4. $\int x e^{5x} dx$ Ans. _____

5. $\int \frac{x}{1+x^4} dx$ Ans. _____

6. $\int \frac{x^3}{1+x^4} dx$ Ans. _____

7. $\int \frac{12}{(x+4)(x+1)} dx$ Ans. _____

Part II

Work all of the following problems. Show your work in the space provided. You need not simplify your answers, but remember that on this part of the exam your work and your explanations are graded, not just the final answers

8. Set up but **do not evaluate** an integral expression to compute the area of the region to the right of $x = 0$, to the left of $x = 4$, and between the curve $y = x^2 - 3x + 2$ and the $x - axis$.

   Do not include any "absolute value" symbols in your answer.

   Do draw a carefully labeled sketch of the region.

9. Let $\boldsymbol{R}$ be the region bounded by $y = 1$ and $y = -x^2 + 2$.

Find the volume of the solid obtained by revolving $\boldsymbol{R}$ around the x-axis. Include a well-labeled sketch of the region. For this question, you must evaluate your answer.

10. For part (a), you do not need to evaluate. For part (b), please do calculate the specific coordinates being requested.

    a. Set up but **<u>do not evaluate</u>** an integral expression to compute the length of the curve given by $y = \ln x, \quad 1 \le x \le e$

    b. Find the centroid $\left(\overline{x}, \overline{y}\right)$ of the homogeneous plane region bounded by $y = 4 - x^2$ and the $x - axis$.

11. The city of Springfield had a population of 200,000 in 1980 and a population of 250,000 in 2000. Assume that its population will continue to grow at an exponential rate. What population can the Springfield city planners expect in the year 2010? Your answer may be stated in terms of the natural log and/or exponential functions.

12. Compute the following integrals

a. $\int x\sqrt{9-4x^2}\,dx$

b. $\int \frac{x^2-3x+3}{x^3-x^2}\,dx$

c. $\int_0^{\frac{\pi}{2}} \left(\cos^3 x\right)\left(\sin^9 x\right)\, dx$

d. $\int x^3\, e^{-x^2}\, dx$

$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$	$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$	$\sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2$

13. Consider the integral $\int_0^3 (x^2+1)\,dx$ and given the above,

(a) Write a Riemann sum $\boldsymbol{R_n}$ approximating the above integral by dividing the interval of integration into ***n*** equal parts, and evaluating the function at the right endpoints of the subintervals.

(b) Using the expression obtained in part (a), let $\boldsymbol{n \to \infty}$, and demonstrate that the value of the integral as a limit of the Riemann sum is 12.

******* END OF EXAM *******