PRINT YOUR NAME LEGIBLY AS IT APPEARS ON CLASS ROLL

LAST name:_____ FIRST name:_____

ID NUMBER: XXX–XX– __ __ __ __

CHECK THE APPROPRIATE SECTION

☐ Dr. Jorgensen Section 206

☐ Dr. Krueger Section 105

☐ Dr. Lin Section 107

☐ Dr. Liu Section 583

ON YOUR SCANTRON FORM, FILL IN THE TABLE:

NAME	last, first		
SUBJECT	MATH 2425-____	TEST NO.	VERS A

TURN OFF ALL CELL PHONES AND BEEPERS

DO NOT WRITE BELOW THIS LINE — DO NOT START UNTIL SO INSTRUCTED

	Points Earned
Part I (50 points)	
11 (10 points)	
12 (10 points)	
13 (10 points)	
14 (10 points)	
15 (10 points)	
PART II (50 points)	
TOTAL SCORE (100 points)	

The square brackets following an exam-question number refer to a section/problem number in the text or a lab worksheet. Problem numbers preceded by the symbol $\sim$ are modeled on that problem from the text or lab, but are not identical to it; problem numbers without the symbol are identical to, or very close to, the problem from the text or lab.

INSTRUCTIONS FOR PART I Write your answers for these questions on a scantron form (882-ES or 882-E) and mark only one answer per question.

Each of the questions in this part counts 5 points each, for a total possible score of 50 points. You may use an approved calculator. You may write on this exam or request scratch paper, if needed.

1. [§6.1: 19] The integral which represents the area of the region bounded by $y = \sin x$, $y = \cos x$, $x = 0$ and $x = \frac{\pi}{2}$ is

   (a) $\int_0^{\frac{\pi}{4}} (\cos x - \sin x)\,dx$ (b) $\int_0^{\frac{\pi}{2}} (\cos x - \sin x)\,dx$ (c) $\int_0^{\frac{\pi}{4}} (\cos x - \sin x)\,dx + \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} (\sin x - \cos x)\,dx$

   (d) $\int_0^{\frac{\pi}{4}} (\sin x - \cos x)\,dx + \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} (\cos x - \sin x)\,dx$ (e) $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} (\sin x - \cos x)\,dx$.

2. [§6.1: 15] The integral which represents the area enclosed by $y = x - 1$ and $y^2 = 2x + 6$ is

   (a) $\int_{-2}^{4} (\sqrt{2x+6} - x + 1)\,dx$ (b) $\int_{-2}^{4} (y - \frac{1}{2}y^2 + 4)\,dy$ (c) $\int_{-1}^{5} (\sqrt{2x+6} - x + 1)\,dx$

   (d) $\int_{-3}^{5} (\sqrt{2x+6} - x + 1)\,dx$ (e) $\int_{-4}^{2} (y - \frac{1}{2}y^2 + 4)\,dy$.

3. [§6.2:$\sim$42] Find the volume of the solid obtained by revolving the region bounded by the curves $y = x^3$, $y = 1$ and $x = 0$ about the y-axis.

   (a) $\frac{3\pi}{5}$ (b) $\frac{4\pi}{5}$ (c) π (d) $\frac{6\pi}{5}$ (e) $\frac{7\pi}{5}$.

4. [§6.3] Find the polar coordinates of the point whose rectangular coordinates are $(-3, 3\sqrt{3})$.

   (a) $(6, \frac{5\pi}{6})$ (b) $(6, \frac{4\pi}{3})$ (c) $(6, \frac{5\pi}{3})$ (d) $(6, \frac{7\pi}{6})$ (e) $(6, \frac{2\pi}{3})$.

5. [§6.4: 8] Find the length of the arc of the curve $y = \frac{1}{3}x^3 + \frac{1}{4}x^{-1}$ on $[1,\ 4]$.

   (a) $\frac{331}{16}$ (b) $\frac{339}{16}$ (c) $\frac{333}{16}$ (d) $\frac{341}{16}$ (e) $-\frac{331}{16}$.

6. [§6.4:$\sim$19] Find the length of the polar curve $r = e^{1-\theta}$ for $0 \le \theta \le 1$.

   (a) $1 - e$ (b) 1 (c) $e - 1$ (d) $\sqrt{2}(e - 1)$ (e) $\sqrt{2}e$.

7. [§7.3: Example 6 & $\sim$34] To compute $\int \sqrt{4 - t^2}\,dt$ by using integration by substitution, one may use

   (a) $t = 4\sin\theta$ (b) $t = 2\sin\theta$ (c) $t = \sqrt{2}\sin\theta$ (d) $t = \sin 2\theta$ (e) $t = \sin 4\theta$.

8. [§7.2: Example 1 Note] You are given that $xF(x) = \int f(x)\,dx$. Find $\int f(x)\ln x\,dx$.

(a) $xF(x)\ln x - f(x)$ (b) $F(x) - \int \ln x\,dx$ (c) $F(x)\ln x$ (d) $xF(x)\ln x - \int F(x)\,dx$ (e) $f(x) + \dfrac{1}{x}$.

9. [§7.2: 9] A first step in integrating $\int x^2 \ln x\,dx$ by parts yields

(a) $\dfrac{x^3}{3}\ln x - \int \dfrac{x^3}{3}\cdot\dfrac{1}{x}\,dx$ (b) $\dfrac{x^3}{3} - \int \dfrac{x^3}{3}\ln x\,dx$ (c) $x^2\ln x - \int x^2\cdot\dfrac{1}{x}\,dx$

(d) $x^3\ln x - \int x^3\cdot\dfrac{1}{x}\,dx$ (e) $3x^3\ln x - \int 3x^2\ln\left(\dfrac{1}{x}\right)\,dx$.

10. [§7.2:∼28] Which of the following methods can be used to evaluate the integral $\int x(ax+b)^3\,dx$, where a and b are nonzero constants?

I. The substitution $u = ax + b$

II. Integration by parts with $u = x$ and $dv = (ax+b)^3\,dx$

III. Perform the indicated multiplication and integrate term by term.

(a) I and II only (b) I, II and III (c) I and III only (d) II and III only (e) III only.

INSTRUCTIONS FOR PART II For these questions, you must write down **all** steps in your solutions **as if you do not have a calculator**. Write legibly, and **label any graphs or pictures**. Draw a box around your solution. Partial credit will be given for those parts of your solution that are correct. Total possible score for this part is 50 points.

11. [§6.1] [10 points] Find the area of the region bounded by $y = \cos x$, $y = e^x$, $x = 0$ and $x = \frac{\pi}{2}$.

12. [§6.3] [10 points]

Find the area of the region inside the circle $r = 5\sin\theta$ and outside the limaçon $r = 2 + \sin\theta$.

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13. [§7.1:∼42] [10 points] Show that $\displaystyle\int \sin x \cos^4 x \, dx = -\frac{1}{5}\cos^5 x + C$, where C is a constant, by using integration techniques.

14. [§7.2: 24] [10 points] Show that $\displaystyle\int \frac{\ln x \sin(\ln x)}{x}\,dx = \sin(\ln x) - (\ln x)\cos(\ln x) + C,$ where C is a constant, by using integration techniques.

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15. [§6.2: Example 6 & ∼55(c)] [10 points] Find the volume of the solid formed by revolving the region bounded by the curve $y = x^{-2}$ and the x-axis, for $1 \le x \le 2$, about the line $x = -1$.

Have you shown all work in Part II? Write version A on scantron form.
Indicate instructor on front of exam.