NAME _____

10-DIGIT PUID _____

REC. INSTR. _____ REC. TIME _____

LECTURER _____

INSTRUCTIONS:

1. There are 7 different test pages (including this cover page). Make sure you have a complete test.
2. Fill in the above items in print.
3. Do any necessary work for each problem on the space provided or on the back of the pages of this test booklet. Circle your answers in this test booklet. No partial credit will be given, but if you show your work on the test booklet, it may be used in borderline cases.
4. No books, notes, calculators or any electronic devices may be used on this exam.
5. Each problem has 8 points. The maximum possible score is 100 points. You get 4 points for attempting the exam.
6. Using a #2 pencil, fill in each of the following items on your scantron sheet:
   (a) On the top left side, write your name (last name, first name), and fill in the little circles.
   (b) On the bottom left side, under SECTION NUMBER, put 0 in the first column and then enter the 3-digit section number. For example, for section 016 write 0016. Fill in the little circles.
   (c) On the bottom, under TEST/QUIZ NUMBER, write 01 and fill in the little circles.
   (d) On the bottom, under STUDENT IDENTIFICATION NUMBER, write in your 10–digit PUID, and fill in the little circles.
   (e) Using a #2 pencil, put your answers to questions 1–12 on your answer sheet by filling in the circle of the letter of your response. Double check that you have filled in the circles you intended. If more than one circle is filled in for any question, your response will be considered incorrect. Use a #2 pencil.
7. After you have finished the exam, hand in your scantron sheet and your test booklet to your recitation instructor.

1. Compute $\int_0^{\pi} \sin^2 x \cos^2 x \, dx$.

A. $\frac{\pi}{16}$

B. $\frac{3\pi}{16}$

C. $\frac{\pi}{4} - \frac{1}{8}$

D. $\frac{\pi}{8} - \frac{1}{16}$

E. $\frac{\pi}{8}$

2. Compute $\int_0^{\frac{\pi}{3}} \sec^3 t \tan t \, dt$.

A. $\frac{8}{3}$

B. $\frac{4}{3}$

C. $\frac{7}{3}$

D. $3\sqrt{2}$

E. $\frac{8\sqrt{2}}{3}$

3. Compute $\displaystyle\int \frac{dx}{\sqrt{-3+4x-x^2}}$.

A. $\tan^{-1}(x-2)+\ln|-3+4x-x^2|+C$

B. $\ln|(x-2)+\sqrt{-3+4x-x^2}|+C$

C. $\sin^{-1}(2x-4)+C$

D. $\sin^{-1}(x-2)+C$

E. $\dfrac{\sin^{-1}(x-2)}{2}-\ln|(x-2)+\sqrt{-3+4x-x^2}|+C$

4. Which integral arises when one makes a trigonometric substitution to compute $\displaystyle\int \frac{x^2}{\sqrt{x^2+4}}\,dx$?

A. $\displaystyle\int 4\tan^2\theta\sec\theta\,d\theta$

B. $\displaystyle\int \frac{2\tan^2\theta}{\sec\theta}\,d\theta$

C. $\displaystyle\int 2\sec^2\theta\tan^2\theta\,d\theta$

D. $\displaystyle\int \frac{4\tan^2\theta}{\sec\theta}\,d\theta$

E. $\displaystyle\int 4\sec^2\theta\tan^2\theta\,d\theta$

5. Which of the following is a possible partial fraction decomposition of $\dfrac{x^2+3x+1}{(x-1)^2(x^2+4)^2}$?

A. $\dfrac{A}{(x-1)^2}+\dfrac{B}{(x^2+4)^2}$

B. $\dfrac{A}{(x-1)^2}+\dfrac{B}{(x-1)}+\dfrac{C}{(x^2+4)^2}$

C. $\dfrac{A}{(x-1)^2}+\dfrac{B}{(x-1)}+\dfrac{Cx+D}{(x^2+4)^2}$

D. $\dfrac{A}{(x-1)^2}+\dfrac{B}{(x-1)}+\dfrac{Cx^2+Dx+E}{(x^2+4)^2}$

E. $\dfrac{A}{(x-1)^2}+\dfrac{B}{(x-1)}+\dfrac{Cx+D}{(x^2+4)}+\dfrac{Ex+F}{(x^2+4)^2}$

6. Compute $\displaystyle\int_3^4 \frac{(1-2x)dx}{x^2-3x+2}$.

A. $\ln 3+3\ln 2$

B. $\ln 3-4\ln 2$

C. $-2\ln 3+\ln 2$

D. $2\ln 3-5\ln 2$

E. $\ln 3-2\ln 2$

7. Compute $\displaystyle\int_0^\infty \frac{dx}{x^2+2x+2}$.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{5}$

D. $\frac{\pi}{3}$

E. $\frac{\pi}{2}$

8. Which of the following are correct?

I) $\displaystyle\int_0^1 \frac{1+5x-x^2}{x}\,dx$ diverges

II) $\displaystyle\int_1^\infty \frac{x^2+2x+1}{x^4}\,dx$ diverges

III) $\displaystyle\int_1^2 \frac{3x+1}{\sqrt{x-1}}\,dx$ converges

A. I and II are true, but III is false

B. I and III are true, but II is false

C. I and III are false, but II is true

D. I, II and III are true

E. I, II and III are false

9. Find the area of the surface obtained by rotating the curve $y = \sqrt{1+x}$, $0 \le x \le 1$ about the x–axis.

A. $2\pi \displaystyle\int_0^1 x\sqrt{1+x}\,dx$

B. $2\pi \displaystyle\int_0^1 x\sqrt{4x+5}$

C. $\pi \displaystyle\int_0^1 \frac{x}{\sqrt{1+x}}\sqrt{4x+5}\,dx$

D. $\pi \displaystyle\int_0^1 \sqrt{4x+5}\,dx$

E. $\pi \displaystyle\int_0^1 \frac{\sqrt{4x+5}}{\sqrt{1+x}}\,dx$

10. The arc length of the curve $y = \ln(\sec x)$, $0 \le x \le \dfrac{\pi}{3}$ is equal to

A. $\ln\left(1+2\dfrac{\sqrt{3}}{3}\right)$

B. $\ln\left(1+3\dfrac{\sqrt{2}}{2}\right)$

C. $\ln(1+\sqrt{2})$

D. $\ln(2-\sqrt{3})$

E. $\ln(2+\sqrt{3})$

11. A lamina in the shape of the region bounded by the curves $y = e^x, y = 0, x = 0$, and $x = 1$ has density 1. Find the moment of the lamina about the x-axis.

A. $\dfrac{2}{e-1}$

B. $\dfrac{e^2-1}{4}$

C. $\dfrac{e+1}{4}$

D. 2

E. $\dfrac{e^2+1}{4}$

12. Which of the following sequences are convergent?

(I) $a_n = \dfrac{1+2n^2}{n+n^2}$

(II) $a_n = \dfrac{\cos n\pi}{2^n}$

(III) $a_n = \cos n\pi$

(IV) $a_n = n \sin \dfrac{1}{n}$

A. All

B. (I) and (II) only

C. (III) and (IV) only

D. (II) and (III) only

E. (I), (II) and (IV) only