MA 16200
EXAM 2 Form 01
March 8, 2018

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

1. You must use a #2 pencil on the scantron.

2. Write 01 in the TEST/QUIZ NUMBER box on the scantron and bubble in the appropriate space below.

3. On the scantron, fill in your TA's name and the course number.

4. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces.

5. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.

6. Sign the scantron.

7. Fill in your name and your instructor's name on the question sheets above.

8. There are 12 questions, each worth 8 points (you will automatically earn 4 points for taking the exam). Blacken in your choice of the correct answer in the spaces provided for questions 1–12. Do all your work on the question sheets.

9. Turn in both the scantron and the exam when you are finished.

10. If you finish the exam before 7:20, you may leave the room after turning in the scantron and the exam. If you don't finish before 7:20, you MUST REMAIN SEATED until your TA comes and collects your scantron and your exam.

11. Show your work and circle your answers on the exam. Although no partial credit will be given, any disputes about grades or grading can be settled by examining your written work on the question sheets.

12. NO CALCULATORS, PHONES, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

13. The last page of the exam contains some possibly useful formulas. You may tear that page out.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.
2. Students must obey the orders and requests by all proctors, TAs, and lecturers.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

I have read and understand the exam rules stated above:

STUDENT NAME: _____

STUDENT SIGNATURE: _____

1. Evaluate $\displaystyle\int_0^1 (2x-1)e^{2x}\,dx$

A. $\dfrac{1+e^2}{2}$

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

C. 1

D. $\dfrac{1}{2}$

E. e^2

2. Which of the following statements are true?

I. $u = \tan x$ is the most appropriate substitution for the integral $\displaystyle\int \tan^5 x \sec^4 x\,dx$

II. $u = \sin(2x)$ is the most appropriate substitution for the integral $\displaystyle\int \cos^3(2x)\sin^4(2x)\,dx$

III. $\displaystyle\int_0^{\pi/2} \cos^2\theta\,d\theta = \frac{\pi}{4}$

A. I and II only

B. I and III only

C. II and III only

D. All are true

E. None is true

3. A rectangular tank with length 3 m, width 2 m, and height h m is full of a certain synthetic oil whose mass density is $\frac{1}{3}$ kg/m^3. If the work required to pump all of the oil to the top and out of the tank is 90 J, how tall is the tank (i.e., what is the value of h)? **Use 10 m/s^2 for the acceleration due to gravity.**

A. 2

B. 3

C. 4

D. 5

E. 6

4. What does the integral $\displaystyle\int \frac{1}{(4+x^2)^{3/2}}\,dx$ become after making the trigonometric substitution $x = 2\tan\theta$?

A. $\displaystyle\frac{1}{4}\int \sin\theta\; d\theta$

B. $\displaystyle\frac{1}{4}\int \tan\theta\; d\theta$

C. $\displaystyle\frac{1}{4}\int \cos\theta\; d\theta$

D. $\displaystyle\frac{1}{4}\int \sec^5\theta\; d\theta$

E. $\displaystyle\frac{1}{4}\int \frac{1}{\sec^2\theta}\,\tan\theta\; d\theta$

5. If a trigonometric substitution is used to solve $\int \sqrt{24 + 10x - x^2}\, dx$, the hypotenuse of the associated right-angle triangle is

A. x

B. $x - 5$

C. $\sqrt{24 + 10x - x^2}$

D. 1

E. 7

6. Evaluate $\displaystyle\int_0^1 \frac{x - 4}{x^2 - 5x + 6}\, dx$.

A. $\ln \dfrac{3}{8} + \tan^{-1} \dfrac{1}{4}$

B. $\tan^{-1} \dfrac{1}{4}$

C. 1

D. $\dfrac{3}{8}$

E. $\ln \dfrac{3}{8}$

7. Which of the following is the correct *form* of the partial fractions decomposition for the given rational function?

$$\frac{x^4+1}{x^2(x+1)^2(x^2+1)^2}$$

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

B. $\dfrac{A}{x}+\dfrac{B}{x^2}+\dfrac{C}{x+1}+\dfrac{D}{(x+1)^2}+\dfrac{E}{x^2+1}+\dfrac{F}{(x^2+1)^2}$

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

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

E. $\dfrac{A}{x}+\dfrac{B}{x^2}+\dfrac{C}{x+1}+\dfrac{D}{(x+1)^2}+\dfrac{Ex+F}{x^2+1}+\dfrac{Gx+H}{(x^2+1)^2}$

8. Evaluate $\displaystyle\int_0^\infty x\,e^{-x^2}\,dx$.

A. 0

B. $\dfrac{1}{2}$

C. 1

D. 2

E. e

9. Find the exact area of the surface obtained by rotating the curve about the x-axis

$$y = 2x, \quad 1 \leq x \leq 3$$

A. $16\sqrt{5}\pi$

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

C. $8\sqrt{5}\pi$

D. $8\sqrt{3}\pi$

E. $4\sqrt{5}\pi$

10. Find the centroid of a thin plate in the shape of the region bounded by $y = \ln x$, $y = 0$, $x = 1$, and $x = e$. Some of the following results may be useful:

$$\int_1^e \ln x \, dx = 1 \qquad \int_1^e x \ln x \, dx = \frac{1 + e^2}{4}$$

$$\int_1^e x^2 \ln x \, dx = \frac{2(1 + e^3)}{9} \qquad \int_1^e (\ln x)^2 \, dx = e - 2$$

A. $\left(\dfrac{1 + e^2}{4}, \dfrac{e - 2}{2} \right)$

B. $\left(\dfrac{e - 2}{2}, \dfrac{1 + e^2}{4} \right)$

C. $\left(\dfrac{1 + e^2}{4}, e - 2 \right)$

D. $\left(e - 2, \dfrac{1 + e^2}{4} \right)$

E. $\left(\dfrac{1 + e^2}{4}, \dfrac{2(1 + e^3)}{9} \right)$

11. Which of the following statements are true?

I. The **sequence** $\left\{\frac{1}{\sqrt{n}}\right\}$ converges

II. The **series** $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ converges

III. The **sequence** $\left\{\sin\left(\frac{(2n-1)\pi}{2}\right)\right\}$ is bounded

A. All are true

B. None is true

C. I and II only

D. I and III only

E. II and III only

12. Does the series $\sum_{n=1}^{\infty} \frac{1+3^n}{7^n}$ converge? If so, what is its sum?

A. Series diverges

B. Series converges, sum is $\frac{35}{12}$

C. Series converges, sum is $\frac{11}{12}$

D. Series converges, sum is $\frac{7}{12}$

E. Series converges, sum is $\frac{11}{4}$

Potentially Useless Formulas

$$\int \sec\theta\, d\theta = \ln|\sec\theta + \tan\theta| + C$$

$$\int \sec^3\theta\, d\theta = \frac{1}{2}\sec\theta\tan\theta + \frac{1}{2}\ln|\sec\theta + \tan\theta| + C$$

$$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta)$$

$$\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$$

$$\sin 2\theta = 2\sin\theta\cos\theta$$