MA 16600 Exam 2, October 2019

Name ____

10–digit PUID number ________________________________

Recitation Instructor ________________________________

Recitation Section Number and Time ________________________

Instructions: **MARK TEST NUMBER 26 ON YOUR SCANTRON**

1. Do not open this booklet until you are instructed to.
2. Fill in all the information requested above and on the scantron sheet. On the scantron sheet fill in the little circles for your name, section number and PUID.
3. This booklet contains 12 problems, each worth 8 points. You will get 4 points for correctly supplying information above and on the scantron.
4. For each problem mark your answer on the scantron sheet and also **circle it in this booklet**.
5. Work only on the pages of this booklet.
6. Books, notes, calculators or any electronic device are not allowed during this test and they should not even be in sight in the exam room. You may not look at anybody else's test, and you may not communicate with anybody else, except, if you have a question, with your instructor.
7. You are not allowed to leave during the first 20 and the last 10 minutes of the exam.
8. When time is called at the end of the exam, put down your writing instruments and remain seated. The TAs will collect the scantrons and the booklets.
9. A collection of trig identities and integrals:

$$\sin(a+b) = \sin a\cos b + \cos a \sin b \qquad 1-\cos 2a = 2\sin^2 a$$
$$\cos(a+b) = \cos a\cos b - \sin a\sin b \qquad 1+\cos 2a = 2\cos^2 a$$
$$\int \sec t\, dt = \ln|\sec t + \tan t| + C$$

1. $\lim_{n \to \infty} \dfrac{\sqrt{3n^2+1}}{\sqrt[3]{n^3-2n}} =$

   A. 0

   B. $3/2$

   C. $1/2$

   D. $-\sqrt{3}/\sqrt[3]{2}$

   E. $\sqrt{3}$

2. The partial fraction decomposition of $\dfrac{(x+1)(x+2)}{(x^2+2x+2)(x-1)^2}$ is of the form

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

   B. $\dfrac{A}{x+1} + \dfrac{B}{x+2}$

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

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

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

3. What substitution to use to evaluate $\int \sqrt{3+3x+x^2}\,dx$?

A. $3x+\sqrt{3}=\sec t$

B. $\dfrac{2x}{\sqrt{3}}+\sqrt{3}=\tan t$

C. $2x+\dfrac{1}{\sqrt{3}}=\sin t$

D. $3x-\sqrt{3}=\tan t$

E. $2x-\sqrt{3}=\sin t$

4. One vertical wall of a bathtub has the shape of the region inside the parabola $y=x^2$, with the y–axis oriented vertically upward and distances measured on both axes in meters. If the tub is filled with water up to level 1 m, what is the total force, in Newtons, of the water on the wall? Hydrostatic pressure at depth u meters below the surface is (approximately) $10^4 u$ N/m^2.

A. $16,000/3$

B. $5,600$

C. $9,000/7$

D. $5,200$

E. $18,000/7$

5. $\displaystyle\int_0^{\pi/2} \sin^3 z \cos^4 z \, dz =$

A. 0

B. 1/35

C. 2/35

D. 3/35

E. 4/35

6. $\displaystyle\int_0^{\infty} \sin u \, du =$

A. 0

B. 1

C. -1

D. 2

E. The integral diverges.

7. Evaluate $\int_0^2 \frac{x^2}{x^2+2x+2}\,dx$. There are several ways to do this; the general method of partial fractions is among the quickest.

A. 3π

B. $1+\pi/2$

C. $2-\ln 5$

D. $\ln 6$

E. $64/15$

8. $\int_1^3 x^2 \ln\frac{x}{3}\,dx =$

A. $\frac{\ln 3}{3} - \frac{26}{9}$

B. $-9 + \frac{\ln 3}{15}$

C. 0

D. $3\ln 6 + \frac{3}{5}$

E. $12 - \frac{3\ln 3}{16}$

9. $\lim_{n\to\infty} \left(1 + \frac{1}{4n}\right)^{2n} =$

A. 1

B. ∞

C. e

D. $\sqrt{e}$

E. e^2

10. $\int_0^{\pi^2} \sin \frac{\sqrt{y}}{2} \, dy =$

A. 1

B. 2

C. 3

D. 5

E. 8

11. The integral $\int_1^\infty \frac{e^{-t}+1}{t}\,dt$

A. is convergent, by comparison with $\int_1^\infty \frac{1}{t}\,dt$;

B. is divergent, by comparison with $\int_1^\infty \frac{1}{t}\,dt$;

C. is convergent, by comparison with $\int_1^\infty e^{-t}\,dt$;

D. is divergent, by comparison with $\int_1^\infty e^{-t}\,dt$.

E. None of the above statements is correct.

12. $\int \frac{dx}{x(x-2)} =$

A. $\ln|(x(x-2)| + C$

B. $\tan^{-1} x(x-2) + C$

C. $\frac{1}{2}\ln\left|\frac{2-x}{x}\right| + C$

D. $\tan x(x-2) + C$

E. $\tan^{-1}\left(\frac{1}{2x} - \frac{1}{2(x-2)}\right) + C$