MA 16600 Exam 3, Test number 26, December 2015

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, four digit section number and PUID.
3. This booklet contains 12 problems, equally weighted.
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:

$$\sin(a+b) = \sin a \cos b + \cos a \sin b \qquad 1 - \cos 2a = 2\sin^2 a$$

$$\cos(a+b) = \cos a \cos b - \sin a \sin b \qquad 1 + \cos 2a = 2\cos^2 a$$

MA 166 Midterm 3, Test number 26, December 2015

1. The parametric equation of a curve is $x = \sin t$, $y = 2/\sin t$. Its tangent has slope -1 when $t =$

   A. $\pi/6$

   B. $\pi/2$

   C. $\pi/4$

   D. $\pi/3$

   E. There is no such t.

2. Which is true? The series $\sum_{k=1}^{\infty} \frac{(-1)^k}{2^k - 3}$ is

   I. convergent II. absolutely convergent

   A. Neither I. nor II. is true.

   B. Only I. is true.

   C. Only II. is true.

   D. Both are true.

   E. None of the answers above is correct.

3. $\displaystyle\int_0^{1/2} \frac{\ln(1-x)}{x}\,dx =$

A. $1 + \frac{1}{2\cdot 2!} + \frac{1}{3\cdot 3!} + \cdots + \frac{1}{n\cdot n!} + \cdots$

B. $-\frac{1}{2} - \frac{1}{4\cdot 2^2} - \frac{1}{9\cdot 2^3} \cdots - \frac{1}{n^2 2^n} - \cdots$

C. $\frac{1}{2} - \frac{3}{4!} + \frac{5}{6!} \pm \cdots + (-1)^n \frac{2n-1}{(2n)!} + \cdots$

D. $1 - \frac{1}{2} + \frac{1}{4} \pm \cdots + \frac{1}{(-2)^n} + \cdots$

E. $\frac{1}{2} + \frac{1}{2\cdot 2^2} + \frac{1}{3\cdot 2^3} + \cdots + \frac{1}{n\cdot 2^n} + \cdots$

4. Which statement is true, concerning the series

$$(1) \quad \sum_{n=1}^{\infty} \frac{n-1}{3n\sqrt{n} - 2n + 1} \quad \text{and} \quad (2) \quad \sum_{n=1}^{\infty} \frac{(-1)^n}{1+\sqrt{n}} \quad ?$$

A. Both converge.

B. (1) converges, (2) diverges.

C. (1) diverges, (2) converges.

D. Both diverge.

E. None of A,B,C,D is true.

5. The function $3x/(3+x^2)$ is represented by the power series

A. $1 - 3x^2 + 9x^4 - \cdots$

B. $1 + 3x^2 + 9x^4 + \cdots$

C. $x + 3x^3 + 9x^5 + \cdots$

D. $x - \dfrac{x^3}{3} + \dfrac{x^5}{9} - \cdots$

E. $1 + \dfrac{x^2}{3} + \dfrac{x^4}{9} + \cdots$

6. If the polar equation of a curve is $r^3 \sin\theta = 2$, its Cartesian equation is

A. $x^2y + y^3 - 2 = 0$

B. $x^2y + xy^2 - 2y = 0$

C. $x^4 + x^2y^2 - 2 = 0$

D. $x^4 + x^3y - 2 = 0$

E. $x^4 + xy^3 - 2y = 0$

7. The interval of convergence of $\sum_{n=1}^{\infty} \frac{n^2 x^n}{4^n}$ is

A. $[-1/4, 1/4]$

B. $(-1/4, 1/4)$

C. $[-1, 1]$

D. $(-4, 4)$

E. $[-4, 4]$

8. Studying a certain series $\sum a_n$, we calculate that $\lim_{n\to\infty} |\frac{a_{n+1}}{a_n}|$ does not exist and that $\lim_{n\to\infty} \sqrt[n]{|a_n|} = 0$. Our conclusion should be:

A. $\sum a_n$ conditionally converges.

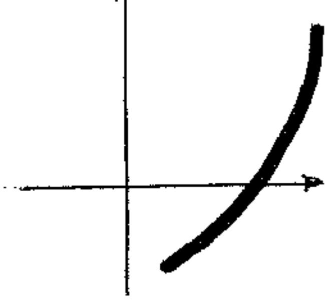
B. $\sum a_n$ absolutely converges.

C. $\sum a_n$ diverges.

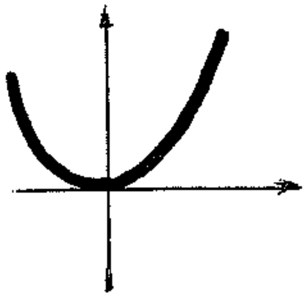
D. The tests were inconclusive.

E. We must have made an error, our two findings contradict each other.

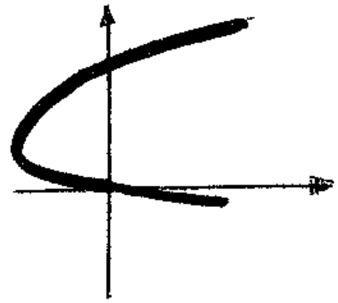
9. The parametric equations $x = t^2 - 2t$, $y = 2 - t$ describe which of the following curves?



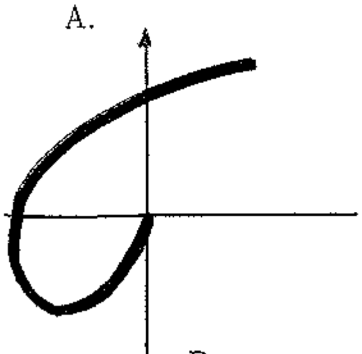
A.



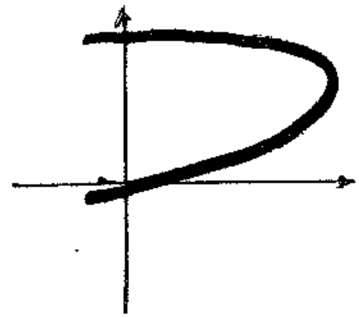
B.



C.



D.



E.

10. Which is true, concerning the series

$$(1) \quad \sum_{k=1}^{\infty} \left(\frac{2k+3}{3k+2}\right)^{2k} \qquad \text{and} \qquad (2) \quad \sum_{m=1}^{\infty} \left(\frac{3m-1}{2m+5}\right)^{m} \qquad ?$$

A. Neither is convergent.

B. (1) converges, (2) diverges.

C. (1) diverges, (2) converges.

D. Both converge.

E. (1) converges and (2) converges conditionally.

11. The McLaurin series of $e^{-2x}\sin 3x$ is

A. $3x - 6x^2 - \frac{3x^3}{2} + 5x^4 \pm \cdots$

B. $2 + 3x - 6x^2 + \frac{x^3}{2} \pm \cdots$

C. $3x - 6x^2 + x^3 - x^4 \pm \cdots$

D. $3x - 21x^3 + 2x^4 + 9x^5 \pm \cdots$

E. $3x + 21x^3 - x^4 + 4x^5 \pm \cdots$

12. The length of the curve given by $x = 2t + \sin t$, $y = 1 - \cos t$ $(0 \leq t \leq \pi)$ is

A. $\int_0^{\pi} \sqrt{4t^2 + 2 + 4t\sin t - 2\cos t}\ dt$

B. $\int_0^{\pi} \sqrt{2 - 2\cos t + \cos^2 t}\ dt$

C. $\int_0^{\pi} \sqrt{1 + \sin^2 t}\ dt$

D. $\int_0^{\pi} \sqrt{3 + 2\cos t + \sin^2 t}\ dt$

E. $\int_0^{\pi} \sqrt{5 + 4\cos t}\ dt$