

MA 2733

Examination 1 – September 22, 2015

Name _____

Section _____

5 T/F, several long answer. 50 points.

General Instructions: Please answer the following, without use of calculators.

You may refer to a 3x5 card, but no other notes. Correct answers without correct supporting work may not receive full credit (excluding the True/False section).

You may use the back of each page for additional answer space (please clearly indicate if you have done so), or scratch work.

Mississippi State University Honor Code: “As a Mississippi State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do.”

Signature _____

0. (1 point) My best estimate of my # of absences from MA 2733 lecture is _____.
(Any good-faith estimate will be marked correct. Honor code applies.)

1. True/False. Enter T or F in each blank. A correct answer is worth 2 points, a blank space is worth 0 points, and a wrong answer is worth -2 points. (Your total on this problem will be rounded up to zero if necessary.)

(a) _____ If $\sum_{n=2}^{\infty} a_n = 2$, then necessarily $\lim_{n \rightarrow \infty} a_n = 0$.

(b) _____ If $\lim_{n \rightarrow \infty} a_n = 2$, then necessarily $\sum_{n=2}^{\infty} a_n$ converges.

(c) _____ If $\sum_{n=1}^{\infty} a_n = \frac{1}{2}$, then $a_n = \frac{1}{3^n}$.

(d) _____ The sequence $a_n = \frac{1}{n!}$ can be expressed recursively as $a_0 = 1$,
 $a_n = \frac{a_{n-1}}{n}$ for $n \geq 1$.

(e) _____ The parametric curve given by $x = t^2$, $y = t$ for t on $(-\infty, \infty)$ is the same as that given by the equation $y = \sqrt{x}$.

2. Parametric and polar equations

(a) (4 points) Find the slope of the tangent line to the parametric curve $x = 2 \cos t$, $y = 4 \sin t$ at $t = \pi/3$.

(b) (5 points) Find the area inside the ellipse bounded by the parametric curve $x = 2 \cos t$, $y = 4 \sin t$ for t on $[0, 2\pi]$.

(c) (6 points) Find the length of the polar curve $r = \cos^2(\theta/2)$ where $0 \leq \theta \leq 2\pi$.

3. (6 points) The “explain” problem.

Explain why $\sum_{n=0}^{\infty} r^n = \infty$ when $r \geq 1$.

4. (6 points each) For each of the following series, determine whether it is convergent or divergent. If it is convergent, find its sum.

(a) $\sum_{n=3}^{\infty} 2 \cdot \cos^n(3)$.

$$(b) \sum_{n=1}^{\infty} \frac{\sqrt{n+1} - \sqrt{n}}{\sqrt{n^2 + n}}.$$

$$(c) \sum_{n=0}^{\infty} \frac{n3^n}{3^n + 2^n}.$$