Scores	
1.	
2.	
3.	
4.	
5.	
Total:	

MA 2733
Examination 3 – November 17, 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 ________________________________

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 $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ are vectors in $\mathbb{R}^3$ with $\vec{\mathbf{a}} \bullet \vec{\mathbf{b}} = 0$, then $\vec{\mathbf{a}}$ is the normal vector to some plane containing $\vec{\mathbf{b}}$.

   (b) _____ The function $f(x) = \sqrt{1-x}$ has a Taylor series around $a = 0$.

   (c) _____ If $\vec{\mathbf{a}}$, $\vec{\mathbf{b}}$, and $\vec{\mathbf{c}}$ are vectors in $\mathbb{R}^3$ so that $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ are orthogonal, and $\vec{\mathbf{a}}$ and $\vec{\mathbf{c}}$ are orthogonal, then necessarily $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}} + \vec{\mathbf{c}}$ are orthogonal.

   (d) _____ The vector function $\vec{\mathbf{r}}(t) = \left\langle \sin t, \sqrt{t^2+1}, |t| \right\rangle$ is continuous at t, for all values of t on $(-\infty, \infty)$.

   (e) _____ For any vectors $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ in $\mathbb{R}^3$, it holds that $\vec{\mathbf{a}} \times \vec{\mathbf{b}} = (\vec{\mathbf{a}} + \vec{\mathbf{b}}) \times \vec{\mathbf{b}}$.

2. Geometry of lines, planes, and curves

   (a) (4 points) Find an equation of the form $ax + by + cz = d$ for the plane containing the points $(1, 0, 0)$, $(0, 2, 0)$, and $(0, 0, 1)$.

   (b) (4 points) Determine whether the points lie all on a line, all on a plane, or neither: $(1, 1, 1)$, $(2, 2, 4)$, $(4, 2, 2)$, $(2, 1, 2)$.

   (c) (4 points) Find the vector equation of a line that passes through the point $(0, 0, 1)$ and that is orthogonal to the plane $2x - 2y + z = 3$.

(d) (4 points) If $\vec{\mathbf{r}}(t) = \left\langle 2t + 1, \frac{\cos t - 1}{t}, \frac{\sin^2 t}{t^2} \right\rangle$, then find $\lim_{t \to 0} \vec{\mathbf{r}}(t)$.

3. (6 points) Consider the surface $z = x^2 - \frac{y^2}{4}$.

   (a) Graph its traces in planes $x = 0$, $x = 1$, and $x = 2$ (all on the same axes).

   (b) Graph its traces in planes $y = 0$, $y = 1$, and $y = 2$ (all on the same axes).

4. Power series representations

   (a) (6 points) Find a power series representation for $x^4 \cos(\sqrt{2} \cdot x^2)$. To receive full credit, isolate the powers of x in your series.

(b) (6 points) Find a power series representation for $\frac{3x}{x^2 - x - 2}$. To receive full credit, isolate the powers of x in your series.
Hint: partial fractions!

5. (6 points) The "explain" problem
Using Taylor's Coefficients Theorem directly, find the Taylor series around $a = 0$ for $f(x) = e^{-2x+1}$.