Name _____
Date: November 26, 2019 Teacher: Asher Roberts

Multivariable Calculus Exam 2

Partial Derivatives
Time—55 minutes
Number of questions—9

A GRAPHING CALCULATOR MAY BE REQUIRED FOR SOME QUESTIONS ON THIS EXAM.

Directions: Solve each of the following problems, using the available space to show all relevant work. Irrelevant work will detract from your score, while answers without work shown will be awarded no credit. Answers with partially correct work will receive partial credit. Each problem is worth 10 points. Use separate paper for scratch work, and do not turn in scratch work with your exam. Do not spend too much time on any one problem.

In this exam:

(1) Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

(2) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g., $\sin^{-1} x = \arcsin x$).

(for teacher use only)

Exam Score			
Question	**Points**	**Question**	**Points**
1		6	
2		7	
3		8	
4		9	20
5			
Overall Score:			

1. Find and sketch the domain of the function $f(x, y) = \arcsin(x^2 + y^2 - 2)$.

2. Find $\lim_{(x,y)\to(0,0)} \dfrac{x^2 y e^y}{x^4 + 4y^2}$, if it exists, or show that the limit does not exist.

3. Find the first partial derivatives of the function $w = ze^{xyz}$.

4. Find an equation of the tangent plane to the surface $z = \sqrt{xy}$ at the point $(1, 1, 1)$.

5. Find $\partial z/\partial s$ and $\partial z/\partial t$ for $z = x^2y^3$, $x = s\cos t$, $y = s\sin t$.

6. Find the directional derivative of the function $f(x, y, z) = xe^y + ye^z + ze^x$ at the point $(0, 0, 0)$ in the direction of the vector $\mathbf{v} = \langle 5, 1, -2 \rangle$.

7. Find the local maximum and minimum values and saddle point(s) of the function $e^y(y^2 - x^2)$.

8. Find the extreme values of $f(x, y, z) = 3x - y - 3z$ subject to the constraints $x + y - z = 0$ and $x^2 + 2z^2 = 1$.

9. Let $f(x, y) = (xy)^{1/3}$ and $g(x, y) = (xy)^{2/3}$. Are either of these functions differentiable?