Math 241 Midterm Exam #2 March 15, 2016

Your name: ______________________ Your NetID: ____________

- No notes, books, or electronics out. No hats or sunglasses on during the exam.
- Show work that justifies your answer. No credit will be given for correct answers without proper justification.
- Scratch paper is provided at the end of the exam. It will not be graded.
- No need to simplify your answers.
- Continuing to write after time has ended will result in the loss of all points on the pages written on.
- Mark your Discussion Section in the table below: **Failure to correctly mark your section will result in a 1 point deduction**

Discussion Section	Instructor	Time (TuTh)	Discussion Section	Instructor	Time (TuTh)
☐ ADA	Ferguson	8am	☐ BDA	Huo	8am
☐ ADB	Ferguson	9am	☐ BDB	Merriman	9am
☐ ADC	Zhang	10am	☐ BDC	Butler	10am
☐ ADD	Tian	11am	☐ BDD	Collier	11am
☐ ADE	Ackermann	12pm	☐ BDE	Ford	12pm
☐ ADF	Aramyan	1pm	☐ BDF	Menon	1pm
☐ ADG	Aramyan	2pm	☐ BDG	Menon	2pm
☐ ADH	Shakan	3pm	☐ BDH	Shi	3pm
☐ ADI	Shakan	4pm	☐ BDI	Shi	4pm
☐ ADJ	Li	8am	☐ BDJ	Chen	9am
☐ ADK	Li	9am	☐ BDK	Collier	10am
☐ ADL	Klajbor Goderich	10 am	☐ BDL	Butler	12 pm
☐ ADM	Klajbor Goderich	2pm	☐ BDM	Ford	2 pm
☐ ADN	Zhang	3pm	☐ BDN	Song	3 pm
☐ AD1	Quan	11am	☐ BDO	Song	4 pm
☐ AD2	Loeb	1 pm	☐ BDP	Chen	8 am
			☐ BDQ	Karve	4 pm
			☐ BDR	Karve	12 pm
			☐ BDS	Huo	10 am

Question:	1	2	3	4	5	6	7	8	9	Total
Points:	3	2	4	4	6	4	4	7	6	40
Score:										

1. (3 points) Consider the function $f(x, y) = xe^{xy}$.

   a. (2 points) Find an equation of the tangent plane to the surface $z = f(x, y)$, at the point $(1, 0, 1)$.

   b. (1 points) Use linear approximation to approximate $f(1.1, -0.1)$.

2. (2 points) Given $e^z = xyz$, find $\frac{\partial z}{\partial x}$.

3. (4 points) Given $f(x, y) = \sin(xy)$, find the maximum rate of change of f at the point $(1, 0)$, and the direction in which this occurs.

4. (4 points) Find the work done by the force field $\mathbf{F}(x, y, z) = (\sin x, \cos y, xz)$ in moving a particle from the origin to $(1, -1, 1)$ along the curve $x(t) = t^3$, $y(t) = -t^2$, $z(t) = t$. (No need to evaluate expressions like $\sin(1), \sin(2)$, et cetera.)

5. (6 points) Find the extreme values of the function $f(x, y) = 3x+y$, under the constraint $4x^2 + y^2 = 1$.

6. (4 points) Find the arclength of the curve $\mathbf{r}(t) = (\cos t, \sin t, \ln(\cos t))$, $0 \le t \le \frac{\pi}{4}$.

7. (4 points) Find a vector function $\mathbf{r}(t)$ that represents the curve of intersection of the two surfaces: $z = \sqrt{x^2 + y^2}$ and $z = 1 + y$.

8. (7 points) Evaluate $\int_C x^3 ds$, where C consists of the arc C_1 of the curve $y = \frac{x^3}{3}$ from $(0,0)$ to $(1, \frac{1}{3})$ followed by the line segment C_2 from $(1, \frac{1}{3})$ to $(2, \frac{4}{3})$.

9. (6 points) Given $f(x, y) = x^3 + y^3 + 3xy$. Find all of the critical points of f, and classify them into local min(s), local max(es), and saddle point(s).

Scratch work will not be graded.

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