Math 241 Midterm Exam #1 September 18, 2014

Your name: _____ Your NetID: _____

No notes, books, or electronics out or hats or sunglasses on during the exam.
You must show your work on all questions.
Mark your Lecture section and your discussion Section in the table below:

Lecture Section	Instructor	Time (MWF)
AL1	Leininger	8am
AL2	Leininger	9am

Lecture Section	Instructor	Time (MWF)
BL1	Tolman	11am
BL2	Tolman	12pm

Lecture Section	Instructor	Time (MWF)
CL1	Cellarosi	2pm
CL1	Cellarosi	3pm

Discussion Section	Instructor	Time (TuTh)
ADA	Hockensmith	8am
ADB	Gartland	9am
ADC	Aramyan	10am
ADD	Aramyan	11am
ADE	Yi	12pm
ADF	Yi	1pm
ADG	Song	2pm
ADH	Tran	3pm
ADI	Tran	4pm
ADJ	Huo	9am
ADK	Song	9am
ADL	Gartland	10 am
ADM	Huo	11am
ADN	Lu	12pm
ADO	Lu	1pm
AD1	Wise	11 am
AD2	Loeb	9am
AD3	Michiels	3pm

Discussion Section	Instructor	Time (TuTh)
BDA	Field	8am
BDB	Field	9am
BDC	McDonald	10am
BDD	McDonald	11am
BDE	Wang	12pm
BDF	Ford	1pm
BDG	Donepudi	2pm
BDH	Romney	3pm
BDI	Romney	4pm
BDJ	Pruitt	8am
BDK	Pruitt	9am
BDL	Wang	10 am
BDM	Gao	11am
BDN	Ford	2pm
BDO	Donepudi	3pm
BDP	Gao	4pm

Discussion Section	Instructor	Time (TuTh)
CDA	Compaan	8am
CDB	Compaan	9am
CDC	Tian	10am
CDD	Weigandt	11am
CDE	Tian	12pm
CDF	Gondolo	1pm
CDG	Golze	2pm
CDH	Golze	3pm
CDI	Gondolo	4pm
CDJ	Taha	8am
CDK	Taha	9am
CDL	Hong	10am
CDM	Hong	11am
CDN	Toprak	12pm
CDO	Toprak	1pm
CDP	Pynn-Coates	2pm
CDQ	Pynn-Coates	3pm

Question:	1	2	3	4	5	6	7	8	Total
Points:	8	5	4	4	6	6	10	7	50
Score:									

1. (8 points) Find an equation for the plane that passes through the point $P = (1, 2, 3)$ and contains the line L given by the parametric equation

$$x(t) = 1 - 3t, \quad y(t) = 3, \quad \text{and} \quad z(t) = 6 + 2t$$

for $-\infty < t < \infty$.

$\square \; x \; + \; \square \; y \; + \; \square \; z \; = \; \square$

2. (5 points) Find $\text{proj}_{\mathbf{a}}\,\mathbf{b}$, the vector projection of $\mathbf{b}$ onto $\mathbf{a}$, when $\mathbf{a} = \langle 1, 3, 2\rangle$ and $\mathbf{b} = \langle 2, -1, 0\rangle$.

$$\text{proj}_{\mathbf{a}}\,\mathbf{b} = \left\langle \quad\boxed{}\quad , \quad\boxed{}\quad , \quad\boxed{}\quad \right\rangle$$

3. (4 points) Which statement is true in $\mathbb{R}^3$?

- ☐ Two planes perpendicular to a third plane are parallel.
- ☐ Two lines parallel to the same plane are parallel.
- ☐ Two lines either intersect or are parallel.
- ☐ Two planes either intersect or are parallel.

4. (4 points) Mark exactly one box corresponding to the correct ending of the sentence.

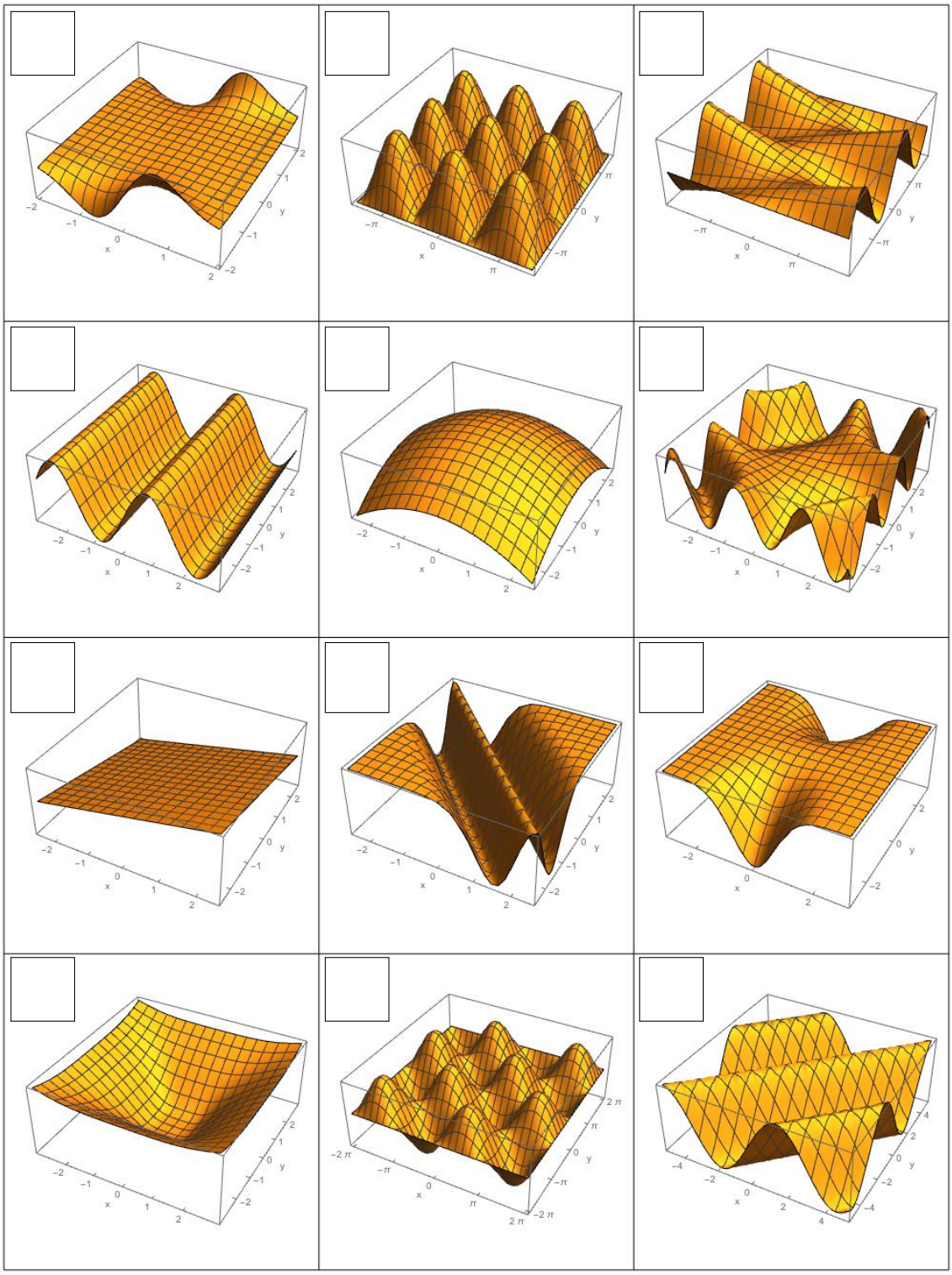
" The limit $\lim_{(x,y)\to(0,0)} \frac{x^2y^2}{x^4+y^4}$ ...

- ☐ ... does not exist because the limits as one approaches $(0,0)$ along the lines $x=0$ and $y=x$ are different."
- ☐ ... does not exist because the limits as one approaches $(0,0)$ along the curves $y=x^2$ and $x=y^2$ are different."
- ☐ ... exists because $\frac{x^2y^2}{x^4+y^4}$ is a composition of continuous functions"
- ☐ ... exists because the partial derivatives of $\frac{x^2y^2}{x^4+y^4}$ are continuous at $(0,0)$"
- ☐ ... exists because the limits as one approaches $(0,0)$ along the lines $y=x$ and $y=-x$ are the same."

5. (6 points) For each function

(a) $\sin(x)\sin(y)$ (b) $-(x+y)^2 e^{-(x+y)^2}$

label its graph from among the options below.



6. (6 points) Consider the function $f(x, y, z) = \cos(x) + x\sin(y) + y^2 z$.

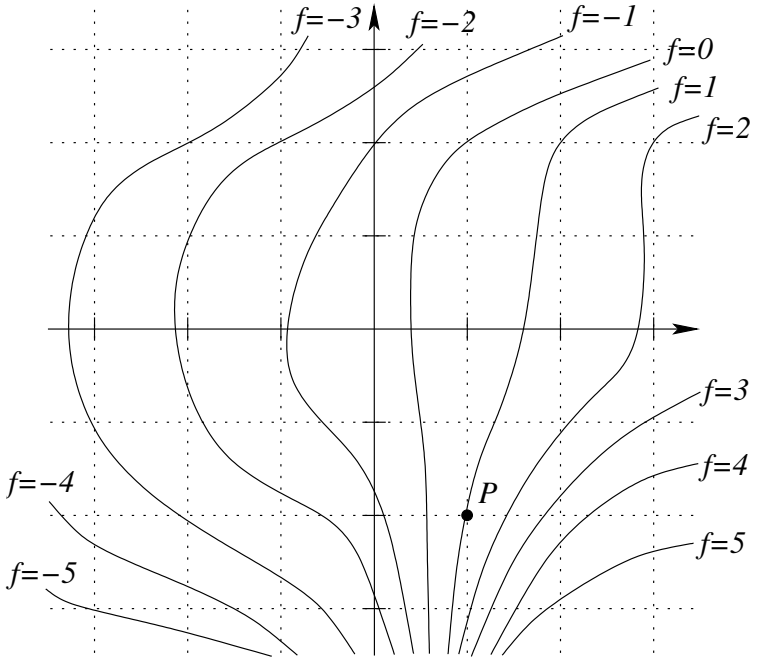
Compute $f_x(\frac{\pi}{2}, 0, 0)$.

$$f_x\left(\frac{\pi}{2}, 0, 0\right) = \boxed{}$$

Compute $f_{zy}(0, \pi, 2)$.

$$f_{zy}(0, \pi, 2) = \boxed{}$$

7. (10 points) Consider the differentiable function f whose level curves (or contours) are shown in the figure. The points $(0, 0)$ and $(1, 0)$ are labeled for reference.



A. Circle the best answer. $f(2, 2) =$

-3	-2	-1	0	1	2	3

B. Circle the best answer. $f_{xy}(1, -2)$ is

positive	negative	zero

C. Circle the best estimate for $h'(0)$ where $h(t) = f(\sin(t), t^2 + 3t + 2)$.

-10	-5	0	5	10

8. (7 points) Find the equation of the tangent plane to the graph $z = x^3 - 2\cos(y)$ at the point $(1, 0, -1)$.

$\square\, x + \square\, y + \square\, z = \square$