Math 241: Midterm 1

Name: Jane Doe **NetID:** jdoe3

Circle your discussion section:

Professor Anema:

- ADA: 8am Field
- ADB: 9am Wen
- ADC: 10am Livesay
- ADD: 11am Livesay
- ADE: Noon Golze
- AD1: 11am Klajbor Goderich
- ADF: 1pm Golze
- AD2: 1pm Donepudi
- ADG: 2pm Shinkle
- ADH: 3pm Shinkle
- ADI: 4pm Field
- ADK: 9am Zhang
- ADL: 10am Zhang
- ADM: 2pm Li
- ADN: 3pm Li

Professor Bell:

- BDA: 8am Dunn
- BDB: 9am Dunn
- BDC: 10am Butler
- BDD: 11am Butler
- BDE: Noon Kaplan
- BDF: 1pm Ahmed
- BDG: 2pm Wen
- BDH: 3pm Tatum
- BDI: 4pm Tatum
- BDJ: 9am Roman-Garcia
- BDK: 10am Roman-Garcia
- BDL: Noon Okano
- BDM: 2pm Carmody
- BDN: 3pm Shin
- BDO: 4pm Okano
- BDR: Noon Carmody
- BDS: 10am Shin

Write and bubble in your UIN:

6	7	5	5	3	2	1	1	1
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

Instructions: You have **75 minutes** to complete this exam. There are **45 points** available and not all problems are weighted equally. Calculators, books, notes, and suchlike aids are **not** permitted. **When space is provided, show work that justifies your answer** as in those problems **credit will not be given** for correct answers without proper justification. Work written outside of the space provided for a problem will **not** be graded.

Do not open exam until instructed.

Do not write in the space below or in the similar areas on each page of the exam. These are reserved for grading.

Ex 2 | Page score | | Ex 2

1. (a) Compute the dot product of $\langle 1,-3,-2\rangle$ and $\langle 2,1,3\rangle$. **(1 point)**

Something

Answer: 6

(b) Compute $\langle 2,1,3\rangle \cdot \langle 3,1,0\rangle \times \langle 1,-1,2\rangle$. **(2 points)**

Something else

Answer: 14

(c) Find the area of the triangle whose vertices are $(2,1,3)$, $(3,1,0)$ and $(1,-1,2)$. **(2 points)**

don't know X

Answer: X

Math 241: Midterm 1

Name: John Doe **NetID:** jdoe2

Circle your discussion section:

Professor Anema:

- ADA: 8am Field
- ADB: 9am Wen
- ADC: 10am Livesay
- ADD: 11am Livesay
- ADE: Noon Golze
- AD1: 11am Klajbor Goderich
- ADF: 1pm Golze
- AD2: 1pm Donepudi
- ADG: 2pm Shinkle
- ADH: 3pm Shinkle
- ADI: 4pm Field
- ADK: 9am Zhang
- ADL: 10am Zhang
- ADM: 2pm Li
- ADN: 3pm Li

Professor Bell:

- BDA: 8am Dunn
- BDB: 9am Dunn
- BDC: 10am Butler
- BDD: 11am Butler
- BDE: Noon Kaplan
- BDF: 1pm Ahmed
- BDG: 2pm Wen
- BDH: 3pm Tatum
- BDI: 4pm Tatum
- BDJ: 9am Roman-Garcia
- BDK: 10am Roman-Garcia
- BDL: Noon Okano
- BDM: 2pm Carmody
- BDN: 3pm Shin
- BDO: 4pm Okano
- BDR: Noon Carmody
- BDS: 10am Shin

Write and bubble in your UIN:

6 7 5 5 3 2 1 1 0

0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9

Instructions: You have **75 minutes** to complete this exam. There are **45 points** available and not all problems are weighted equally. Calculators, books, notes, and suchlike aids are **not** permitted. **When space is provided, show work that justifies your answer** as in those problems **credit will not be given** for correct answers without proper justification. Work written outside of the space provided for a problem will **not** be graded.

Do not open exam until instructed.

Do not write in the space below or in the similar areas on each page of the exam. These are reserved for grading.

Ex 1 | Page score | | Ex 1

4. The plane P has normal vector $\langle 3,3,6\rangle$ and passes through $(0,-1,0)$. Find the shortest vector $\mathbf{v}$ from $(9,2,-3)$ to P. **(5 points)**

$\mathbf{v} = \langle \quad , \quad , \quad \rangle$

1. (a) Compute the dot product of $\langle 1,-3,-2\rangle$ and $\langle 2,1,3\rangle$. **(1 point)**

Answer:

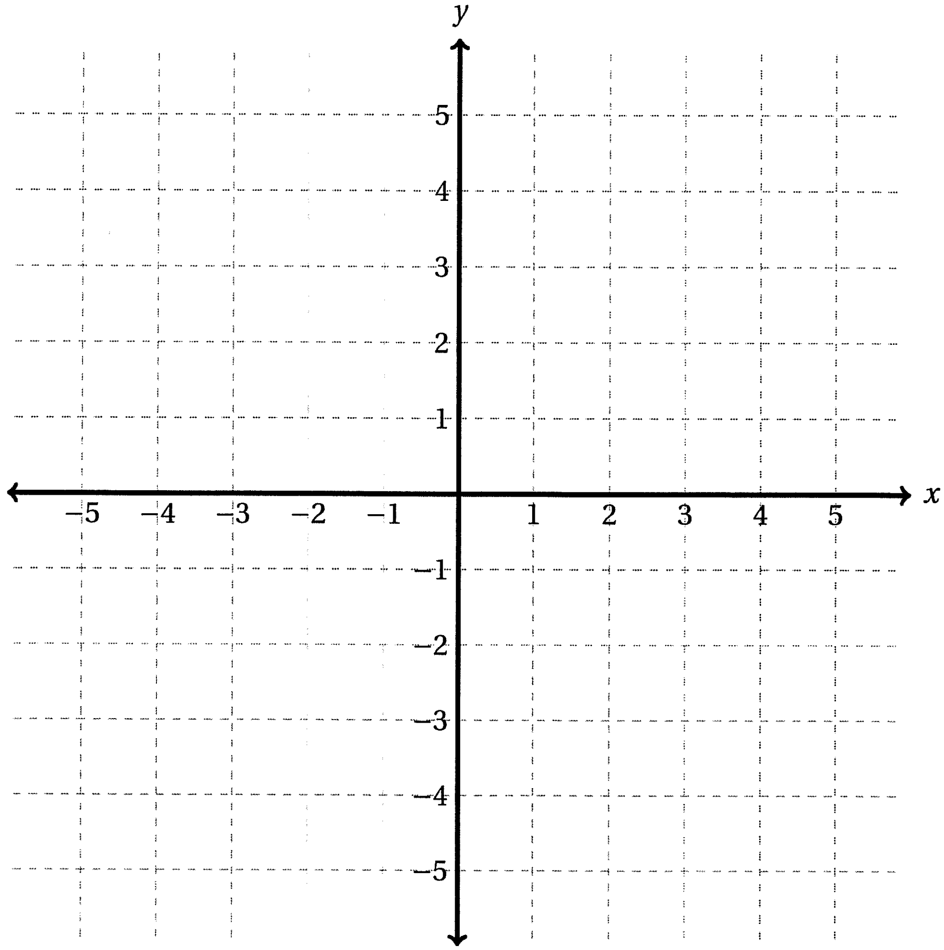
(b) Compute $\langle 2,1,3\rangle \cdot \langle 3,1,0\rangle \times \langle 1,-1,2\rangle$. **(2 points)**

Answer:

(c) Find the area of the triangle whose vertices are $(2,1,3)$, $(3,1,0)$ and $(1,-1,2)$. **(2 points)**

Answer:

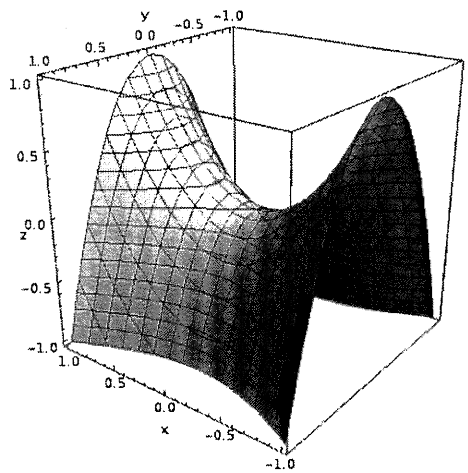
6. Sketch a contour map of $f(x, y) = x^2 - 4x + y^2 + 5$ for level curves corresponding to $z = 2, 5$ and 10. **(4 points)**

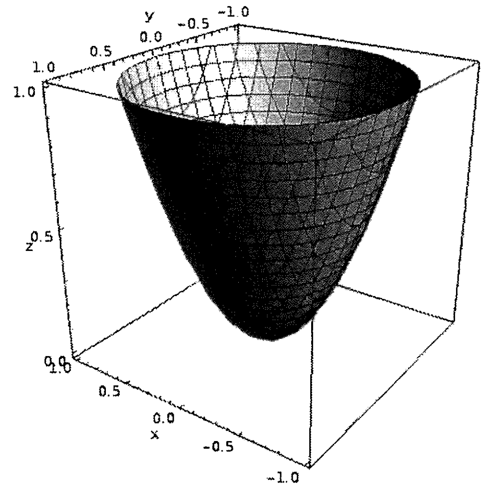


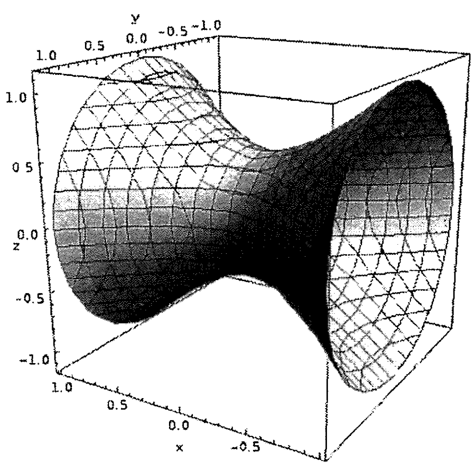
Ex 2 | Page score 4 | 0 1 2 3 4 | Ex 2

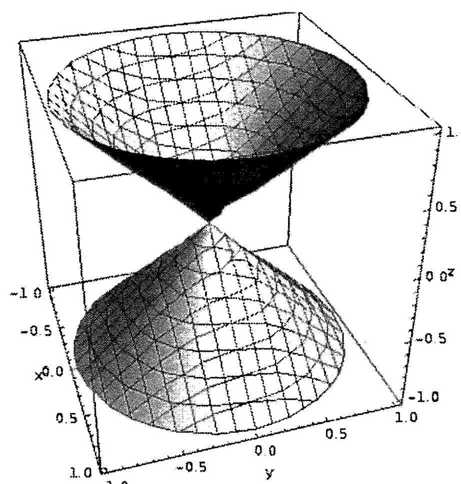
5. **(1 point each + 1 for at least three correct)** Identify the equations of each of the following graphs (write the letter of your selection below each graph):

(A) $x^2 + y^2 + z^2 = 1$ (E) $x^2 + y^2 - z^2 = 0$
(B) $x^2 + y^2 - z = 0$ (F) $x^2 - y^2 - z = 0$
(C) $x^2 - y^2 - z^2 = 1$ (G) $-x^2 + y^2 + z^2 = 1$
(D) $x^2 + y^2 + z^2 = 0$ (H) $x^2 + y^2 + z^2 = -1$









Ex 2 | Page score 5 | 0 1 2 3 4 ~~5~~ | Ex 2

3. (a) Give a vector **v** perpendicular to the plane that contains the line $x = 1 + t$, $y = 2 + t$, $z = 3 - t$ and the line $x = -1 + 2t$, $y = 2$, $z = 1 + 2t$. **(3 points)**

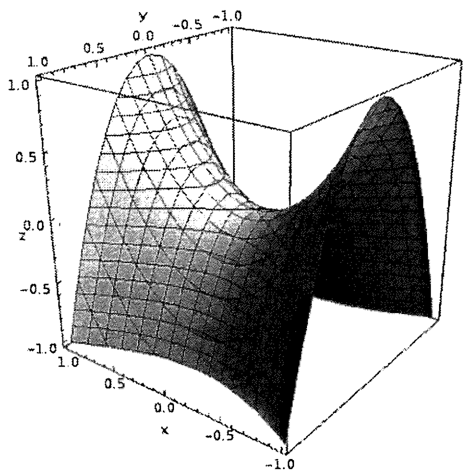
$\mathbf{v} = \langle \quad , \quad , \quad \rangle$

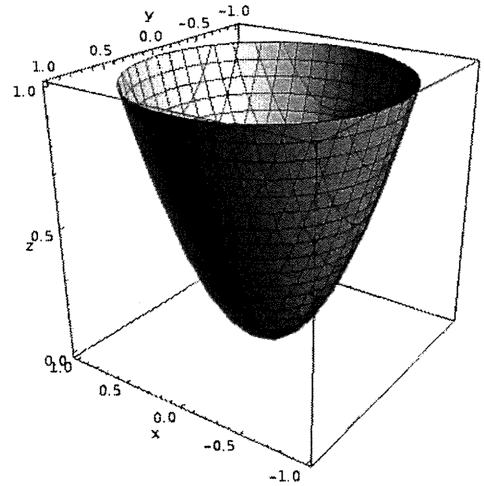
(b) Find the angle θ between the planes $-2x + 4y + 2z = 12$ and $3x + y + z = -1$. **(4 points)**

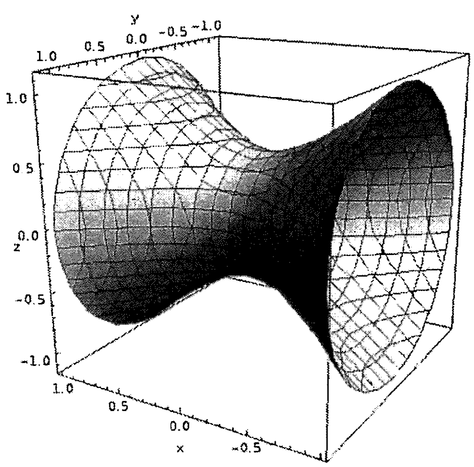
$\theta =$

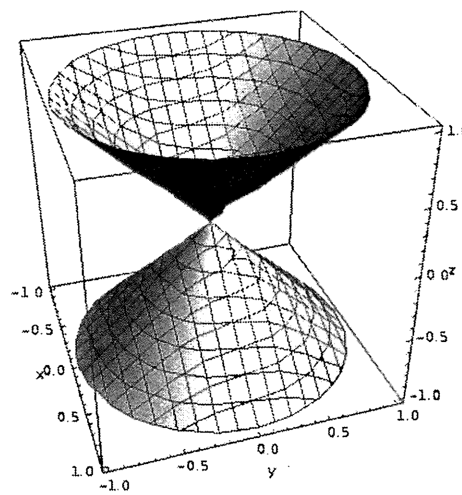
5. **(1 point each + 1 for at least three correct)** Identify the equations of each of the following graphs (write the letter of your selection below each graph):

(A) $x^2 + y^2 + z^2 = 1$ (E) $x^2 + y^2 - z^2 = 0$
(B) $x^2 + y^2 - z = 0$ (F) $x^2 - y^2 - z = 0$
(C) $x^2 - y^2 - z^2 = 1$ (G) $-x^2 + y^2 + z^2 = 1$
(D) $x^2 + y^2 + z^2 = 0$ (H) $x^2 + y^2 + z^2 = -1$



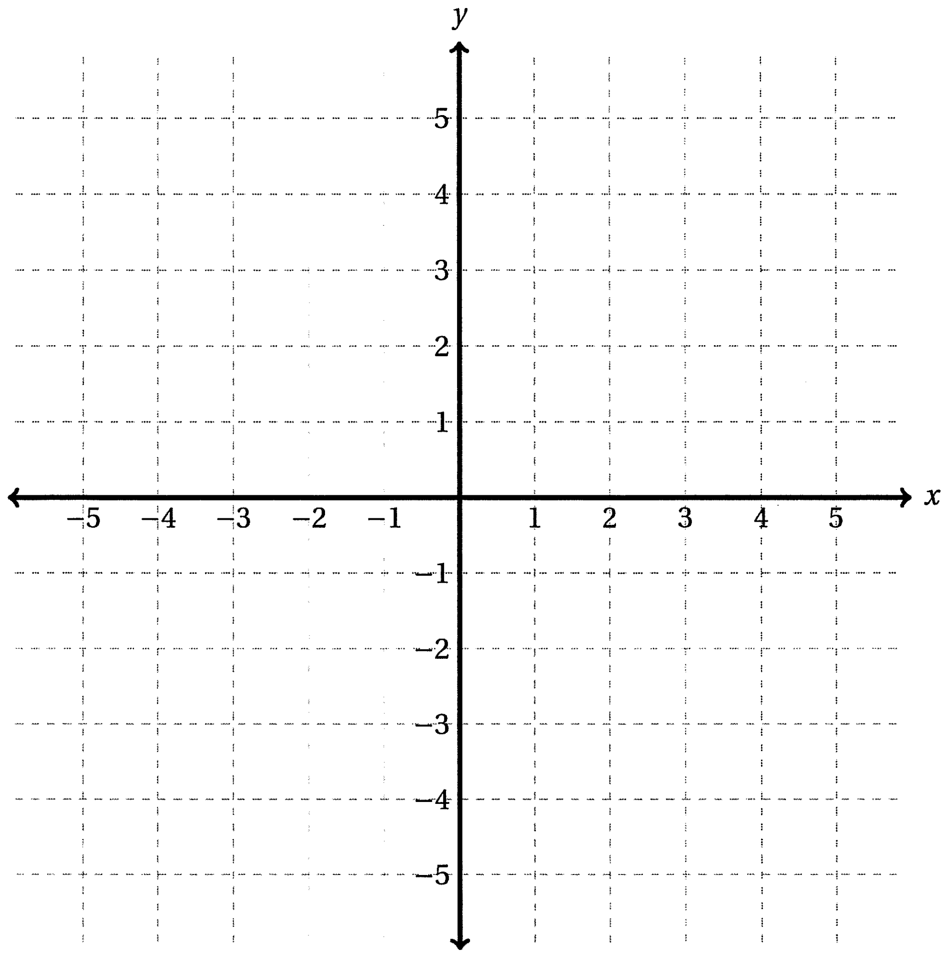






Ex 1 3 Page score 0 1 2 3 4 5 Ex 1

6. Sketch a contour map of $f(x,y) = x^2 - 4x + y^2 + 5$ for level curves corresponding to $z = 2, 5$ and 10. **(4 points)**



Ex 1

4

Page score

0 1 2 3 4

Ex 1

2. **(1 point each)** Which of the following properties hold for all vectors $\mathbf{u}$ and $\mathbf{v}$ and scalars c and d? For each property, circle either True or False.

(a) $\mathbf{u}+\mathbf{v}=\mathbf{v}+\mathbf{u}$ True / False

(b) $\mathbf{u}\times\mathbf{v}=\mathbf{v}\times\mathbf{u}$ True / False

(c) $\mathbf{u}+\mathbf{v}=\mathbf{u}\times\mathbf{v}$ True / False

(d) $\mathbf{u}\cdot\mathbf{u}=|\mathbf{u}|$ True / False

(e) $\mathbf{u}\times\mathbf{u}=\mathbf{0}$ True / False

(f) $(c+d)(\mathbf{u}+\mathbf{v})=c\mathbf{u}+d\mathbf{v}$ True / False

7. Consider each of the following limits. In each case does this limit exist (you must justify your answer)? If so, what is its value?

(a) $\lim_{(x,y)\to(0,0)} y^4 + xy + 3$ **(1 point)**

(b) $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+2y^2}$ **(3 points)**

(c) $\lim_{(x,y)\to(0,0)} \frac{3xy^2+x^2y}{x^2+y^2}$ **(3 points)**

Ex 1 | 6 Page score | 0 1 2 3 4 5 ~~6~~ 7 | Ex 1

8. **(2 points each)** Let $f(x, y) = x^3 + \sin(xy^2)$. Compute:

(a) $f_x = \boxed{}$

(b) $f_y = \boxed{}$

(c) $\dfrac{\partial^2 f}{\partial x \partial y} = \boxed{}$

2. **(1 point each)** Which of the following properties hold for all vectors $\mathbf{u}$ and $\mathbf{v}$ and scalars c and d? For each property, circle either True or False.

(a) $\mathbf{u}+\mathbf{v}=\mathbf{v}+\mathbf{u}$ — True / False

(b) $\mathbf{u}\times\mathbf{v}=\mathbf{v}\times\mathbf{u}$ — True / False

(c) $\mathbf{u}+\mathbf{v}=\mathbf{u}\times\mathbf{v}$ — True / False

(d) $\mathbf{u}\cdot\mathbf{u}=|\mathbf{u}|$ — True / False

(e) $\mathbf{u}\times\mathbf{u}=\mathbf{0}$ — True / False

(f) $(c+d)(\mathbf{u}+\mathbf{v}) = c\mathbf{u}+d\mathbf{v}$ — True / False

7. Consider each of the following limits. In each case does this limit exist (you must justify your answer)? If so, what is its value?

(a) $\lim_{(x,y)\to(0,0)} y^4 + xy + 3$ **(1 point)**

(b) $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+2y^2}$ **(3 points)**

(c) $\lim_{(x,y)\to(0,0)} \frac{3xy^2+x^2y}{x^2+y^2}$ **(3 points)**

Ex 2 | Page score 5 | 0 1 2 3 4 $\cancel{5}$ 6 7 | Ex 2

8. **(2 points each)** Let $f(x, y) = x^3 + \sin(xy^2)$. Compute:

(a) $f_x = \boxed{}$

(b) $f_y = \boxed{}$

(c) $\dfrac{\partial^2 f}{\partial x \partial y} = \boxed{}$

Ex 2

Page score 5

0 1 2 3 4 ~~5~~ 6

Ex 2

4. The plane P has normal vector $\langle 3,3,6\rangle$ and passes through $(0,-1,0)$. Find the shortest vector $\mathbf{v}$ from $(9,2,-3)$ to P. **(5 points)**

$\boxed{\mathbf{v} = \langle \quad , \quad , \quad \rangle}$

Ex 2

4 Page score

0 1 2 3 4 5

Ex 2

3. (a) Give a vector **v** perpendicular to the plane that contains the line $x = 1 + t,\ y = 2 + t,\ z = 3 - t$ and the line $x = -1 + 2t,\ y = 2,\ z = 1 + 2t$. **(3 points)**

$\mathbf{v} = \langle \quad , \quad , \quad \rangle$

(b) Find the angle θ between the planes $-2x+4y+2z = 12$ and $3x+y+z = -1$. **(4 points)**

$\theta =$

Ex 1	6	Page score	0	1	2	3	4	5	6	7	Ex 1