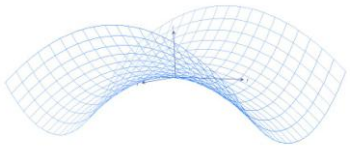
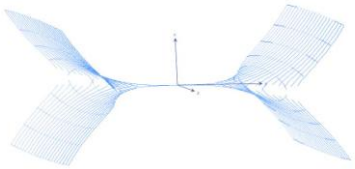
MATHEMATICS 54: ELEMENTARY ANALYSIS II
SAMPLE THIRD LONG EXAM

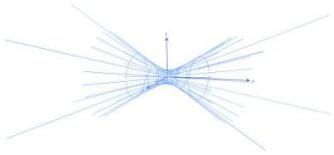
General Direction: *Use black or blue ballpen. Show neat and clean solutions to obtain full points.*

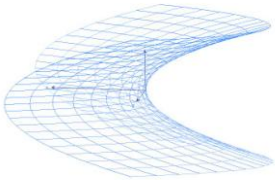
I. Match the equations to their corresponding graphs.

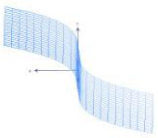
1. $x = z^3$
2. $x^2 + z^2 = y^6$
3. $4x^2 - 4y^2 = z$
4. $x^2 - y^2 + z^2 = 1$
5. $4x^2 + 9y^2 = 36 - 4z^2$

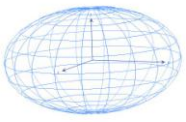
a. 

b. 

c. 

d. 

e. 

f. 

II. Do as indicated.

1. Consider the vector $\vec{V} = \langle 5, -4, -2\sqrt{2} \rangle$.
   a. Find the *direction cosines* of $\vec{V}$.
   b. Let $\vec{W} = \langle 3,4,0 \rangle$. Find the *vector projection* of $\vec{V}$ onto $\vec{W}$.

2. Consider the parallelepiped which is composed of vectors $\vec{A} = \langle -1, -2,1 \rangle$, $\vec{B} = \langle 0,2,0 \rangle$ and $\vec{C} = \langle 2,3,3 \rangle$. Determine the volume of the parallelepiped.

3. Given the sphere $x^2 + y^2 + z^2 - 6x + y + 7 = 0$.
   a. Find the center and radius of the sphere.
   b. Determine the parametric equation of the line passing the center of the sphere and is parallel to the vector $\langle 3, -2, 1 \rangle$.

4. Find the equation of the plane consisting the points $P_1(3,1,5)$, $P_2(-1,-1,-1)$ and $P_3(-2,2,4)$.

5. Consider the planes $\pi_1 : -3x + y - 4z = 1$ and $\pi_2 : x - y + 5z = 3$. Determine the *symmetric* and *parametric equation*s of the line of intersection of the two planes.

6. Find the distance between the plane $\pi: 4x + 2y - 4z = 3$ and the point $(1, -1, 3/2)$.

END OF EXAM