

**MAT 261 Exam I Spring 2007****Name**

1. (36 pts) Let  $\mathbf{u} = \langle 2, 0, 1 \rangle$  and  $\mathbf{v} = \mathbf{j} + \mathbf{k}$ . Determine the following:

a.  $\mathbf{u} \times \mathbf{v}$ .

b.  $\hat{\mathbf{v}} \cdot \mathbf{u}$ .

c. The angle between  $\mathbf{u}$  and  $\mathbf{v}$ .

d. Normalize  $\mathbf{u}$ .

e. Find the equation the plane passing through (1,2,3) containing the vectors  $\mathbf{u}$  and  $\mathbf{v}$ .

f. Give the vector projection of  $\mathbf{u}$  along  $\mathbf{v}$ .

Problem	Score
1 (36 pts)	
2 (20 pts)	
3 (26 pts)	
4 (18 pts)	
Total (100 pts)	

2. (20 pts) Consider the points (1,0,1), (1,1,0), (0,1,1).

a. Find the symmetric equations for the line passing through the first two of these points..

b. What is the equation of the plane?

c. What is the area of the triangle having these points as its vertices?

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3. (26 pts) Do the following:

a. Find the volume of the parallelepiped that is formed by  $\mathbf{a} = \langle 1, 0, 1 \rangle$ ,  $\mathbf{b} = \langle 0, 1, 0 \rangle$ ,  $\mathbf{c} = \langle 1, -2, 3 \rangle$ .

b. What are the center and radius of the circle  $x^2 + y^2 + z^2 + 4x + 6y - 10z + 2 = 0$ .

c. Consider the surface described by the equation  $x^2 + y^2 - z^2 = 1$ . Sketch and label the intersections of this surface with planes parallel to the  $yz$ -plane.

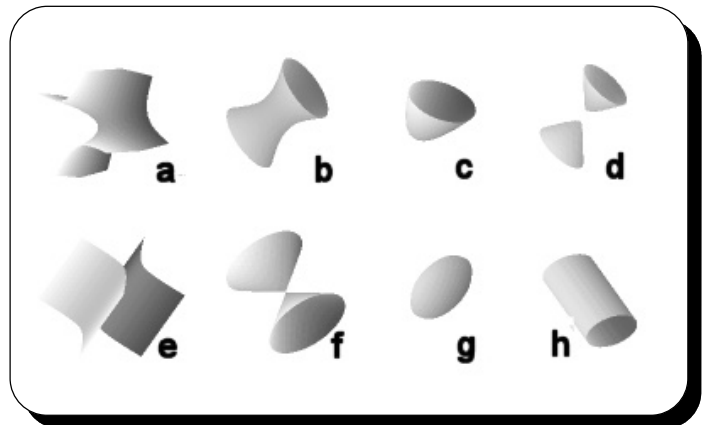
d. Write the equation  $x^2 + y^2 + z^2 = 2x$  in  
i. cylindrical coordinates

ii. spherical coordinates

4. (18 pts) **Match** the surface by placing the letter in the table corresponding to the figures and equations below. If there is no match to the name, write "none" in the space.

Name	Figure	Equation
Hyperbolic Cylinder		
Ellipsoid		
Hyperbolic Paraboloid		
Hyperboloid of One Sheet		
Elliptic Cylinder		
Cone		
Elliptic Paraboloid		
Parabolic Cylinder		
Hyperboloid of Two Sheets		

**The Surface Plots:**



**The Equations:**

a.  $z^2 + y^2 - x^2 = 0$

b.  $x^2 - y^2 + z = 0$

c.  $\frac{1}{2}y^2 - x^2 - 2z^2 = 0.1$

d.  $z^2 + 2y^2 = 5$

e.  $x^2 + 2z = 0$

f.  $x^2 + \frac{1}{2}z^2 - y = 0$

g.  $x^2 + \frac{1}{4}y^2 + \frac{1}{2}z^2 = 1$

h.  $z^2 - x^2 = 1$