Math 2215
Multivariable Calculus

# Georgia State University <br> (This paper consists of $\mathbf{7}$ pages.) 

Exam I
February 03, 2003
Points: $100-\mathrm{A}$


You have a choice of 12 different problems that count from 5 through 25 points. If your overall score exceeds " 91 ", you will get an "A". The points above 91 will be treated as an extra credit.

Show all of your work. Calculators are not needed or permitted. Write neatly. Place answers in the space provided.

1 (10 points). Find the sphere containing the centers of the following spheres

$$
x^{2}+y^{2}+z^{2}-2 y-6 z=0 \quad \text { and } \quad x^{2}+y^{2}+z^{2}-2 x-6 y=20
$$

Sketch them.

Math 2215
Multivariable Calculus
2 (15 points). Find the angle at which the line $\frac{x+2}{1}=\frac{y}{2}=\frac{z-3}{3}$ intersects the plane $2 x-z-1=0$ ? Find the coordinates of the point of intersection.

Math 2215
Multivariable Calculus
3 (10 points). When the vectors $\mathbf{a}(x-1,2)$ and $\mathbf{b}(-2, y)$ are orthogonal and $\|\mathbf{a}\|=\|\mathbf{b}\|$ ?

Math 2215
Multivariable Calculus

4 (30 points). Given three points $P(1,0,2), Q(2,2,1)$ and $R(0,1,4)$. Find:

- the area of the triangular $P Q R$
- the equation of the plane containing the points $P, Q$ and $R$
- equations for the line through the point $P$ which is perpendicular to the plane containing all three points.

Math 2215
Multivariable Calculus
5 (10 points). Show that the points $\mathrm{A}(2,-1,-2), \mathrm{B}(1,2,1), \mathrm{C}(2,3,0)$ and $\mathrm{D}(5,0,-6)$ belong to the same plane.

Math 2215
Multivariable Calculus

6 (10 points). Find the equation of the plane that parallel to the plane $x-2 y+2 z-5$ so the distance between the plane is 2 .

Math 2215
Multivariable Calculus

7 (15 points). Let

$$
\mathbf{d}_{1}=\mathbf{i}+2 \mathbf{j}+4 \mathbf{k} \quad \text { and } \quad \mathbf{d}_{2}=-\mathbf{i}-\mathbf{j}+3 \mathbf{k} .
$$

be the directional vectors of two lines that intersect at the point $(0,-1,1)$. Find the angle of intersection and the plane the lines belong to.

