

Georgia State University  
(This paper consists of 7 pages.)

Exam I

February 03, 2003

Points: 100 — A

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Last name: \_\_\_\_\_  
First name: \_\_\_\_\_

POINTS

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

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

Sketch them.

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

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



**5 (10 points).** Show that the points  $A(2, -1, -2)$ ,  $B(1,2,1)$ ,  $C(2,3,0)$  and  $D(5,0,-6)$  belong to the same plane.

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

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.