

**Name:** \_\_\_\_\_

**4-digit code:** \_\_\_\_\_

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has four (4) pages, including this one.
- You have fifty (50) minutes to complete the test.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

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Page	Max. points	Your points
2	55	
3	25	
4	20	
<b>Total</b>	100	

**Problem 1** (15 pts). Find the distances from the point  $(3, 7, -5)$  to the three coordinate axes.

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**Problem 2** (10 pts). Find an exact expression for the angle  $\theta$  between the vectors  $\mathbf{v} = \langle 3, -1, 5 \rangle$  and  $\mathbf{w} = \langle -6, 2, -15 \rangle$ .

$$\theta =$$

**Problem 3** (15 pts). Find a unit vector  $\mathbf{v}$  that is orthogonal to both  $\mathbf{i} + \mathbf{j}$  and  $\mathbf{i} - \mathbf{j} + \mathbf{k}$ .

$$\mathbf{v} =$$

**Problem 4** (15 pts). Determine whether the points  $A = (0, -5, 5)$ ,  $B = (1, -2, 4)$ ,  $C = (0, 0, 0)$  and  $D = (3, 4, 2)$  are coplanar.

**Problem 5** (15 pts). Consider the sphere that goes through the origin, and whose center is the point  $P = (1, 3, 2)$ . Find the equation of the circle of intersection of this sphere with the  $xy$ -plane.

sphere:

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**Problem 6** (10 pts). Consider the point  $P = (0, 1, 1)$  and the line  $\ell$  with parametric equations

$$\begin{cases} x = 3 + t \\ y = 2t \\ z = 1 - t \end{cases}$$

(a) Find the equation of a plane that goes through  $P$  and is perpendicular to  $\ell$ .

plane:

(b) Compute the intersection of the line  $\ell$  with that plane.

point:

**Problem 7** (20 pts). Find parametric equations for the line of intersection of the planes  $x+y+z = 1$  and  $x + 2y + 2z = 1$ . Find the angle  $\theta$  between the two planes.

 $\theta =$ 

line: