**Name:** _____

**VIP ID:** _____

- Write your name and VIP ID 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 | 50 | |
| 3 | 40 | |
| 4 | 10 | |
| **Total** | 100 | |

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

| to the $x$–axis | to the $y$–axis | to the $z$–axis |
|---|---|---|
| | | |

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

$\theta =$

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**Problem 3** (10 pts)**.** Find a unit vector $\boldsymbol{v}$ that is orthogonal to both $\boldsymbol{i} + \boldsymbol{j}$ and $\boldsymbol{i} - \boldsymbol{j} + \boldsymbol{k}$.

$\boldsymbol{v} =$

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**Problem 4** (5 pts)**.** Determine whether the points $A = (0, -5, 5)$, $B = (1, -2, 4)$ and $C = (3, 4, 2)$ lie on a straight line.

○ Yes

○ No

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**Problem 5** (10 pts)**.** Determine whether the points $A = (0, -5, 5)$, $B = (1, -2, 4)$, $C = (0, 0, 0)$ and $D = (3, 4, 2)$ are coplanar.

○ Yes

○ No

**Problem 6** (10 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.

circle: [ ]

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**Problem 7** (30 pts—10 pts each part)**.** 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: [ ]

(c) Compute the distance $d$ from $P$ to $\ell$.

$d =$ [ ]

**Problem 8** (10 pts—5 pts each part)**.** 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.

line: $\begin{cases} x &= \\ y &= \\ z &= \end{cases}$

$\theta =$