Math 115  
Practice Problems for Exam 2

1. Find the equation of the plane that contains the lines

\[ x = 2 - t, \ y = 4 + t, \ z = 3 \]

and

\[ x = 1 + t, \ y = 5 - 2t, \ z = 3 - t. \]

2. (a) Find parametric equations for the line that is perpendicular to the plane 2x – y + z = 3

and passes through the point (0, 0, 2).

(b) For the line in (a), find the point where the line intersects the plane 2x – y + z = 14.

3. Sketch the graphs of the surfaces (a) \( y = 4x^2 + z^2 \) and (b) \( x + 4y + 3z = 24 \).

4. (a) Find parametric equations for the line of intersection of the planes

\[
\begin{align*}
2x - \quad 4y + \quad 6z &= 0 \\
x - \quad 3y &= 12.
\end{align*}
\]

(b) Determine whether the line \( x = 2 - t, \ y = 3 + t, \ z = 4 - t \), and the plane \( 2x + 2y = 5 \)

are parallel, perpendicular, or neither. Justify your answer.

5. Find all solutions to the following system of equations.

\[
\begin{align*}
x_1 + x_2 + 3x_3 + x_4 &= 0 \\
x_1 - x_2 + 5x_3 - x_4 &= 0
\end{align*}
\]

6. Determine whether the lines below intersect in a point, are parallel, or are skew.

\[
\begin{align*}
x &= 2 - 3t & \quad y &= 3 - 4t & \quad z &= t \\
x &= 1 + 2t & \quad y &= 2t & \quad z &= 3 + 4t
\end{align*}
\]

7. Find the equation of the plane that contains the line with parametric equations \( x = 2 - 3t, \ y = 4 + t, \ z = -1 + 2t \) and is perpendicular to the plane \( x + y - 3z = 4 \).
8. Complete the table below by matching each equation with its graph in \( \mathbb{R}^3 \) and identifying the type of surface.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Graph in ( \mathbb{R}^3 )</th>
<th>Type of Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>( z = 2x^2 + y^2 )</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>( z = \sqrt{4 - x^2 - 4y^2} )</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>( z = 2 + x + 2y )</td>
<td>III</td>
<td></td>
</tr>
<tr>
<td>( z = 2y^2 - x^2 )</td>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

IV

V

VI