

## Exam 1

### Quick Problems (No Work Necessary for Credit)

Word bank for your convenience: Ellipsoid, Hyperbolic Paraboloid, Cone, Elliptic Paraboloid, Hyperboloid of One Sheet, Hyperboloid of Two Sheets.

1. Identify the surface  $z = 7x^2 + 4y^2$ .
2. Let  $\vec{a}$  and  $\vec{b}$  be vectors in  $\mathbb{R}^3$ . Let  $\vec{v} = \vec{a} \times \vec{b}$ . Evaluate  $\vec{v} \cdot \vec{a}$ .
3. Let  $\vec{v}$  lie in the plane  $4x + 3y - 8z + 9 = 0$ . Evaluate  $\vec{v} \cdot \langle 4, 3, -8 \rangle$ .
4. Which of the following four lines are parallel:

$$L_1 : x = 1 + 6t, y = 1 - 3t, z = 12t + 5$$

$$L_2 : x = 1 + 2t, y = t, z = 1 + 4t$$

$$L_3 : 2x - 2 = 4 - 4y = z + 1$$

$$L_4 : \vec{r} = \langle 3, 1, 5 \rangle + t\langle 4, 2, 8 \rangle.$$

### Short Answer (Show Your Work)

5. Find the parametric equations for the line passing through the point  $P(1, 2, 3)$  and perpendicular to the plane  $-2x - y + 2z - 1 = 0$ .
6. Find the distance between the skew lines with parametric equations

$$L_1 : x = 1 + t, y = 1 + 6t, z = 2t$$

$$L_2 : x = 1 + 2s, y = 5 + 15s, z = -2 + 6s.$$

7. Find the volume of the parallelepiped determined by  $\vec{a} = \langle 1, 2, 3 \rangle$ ,  $\vec{b} = \langle -1, 1, 2 \rangle$ , and  $\vec{c} = \langle 2, 1, 4 \rangle$ .

### Bonus

8. Where does the line through  $(1, 0, 1)$  and  $(4, -2, 2)$  intersect the plane  $x + y + z = 6$ ?