1. Describe the graph of $xyz = 0$ in 3–space.

2. Describe the graph of $x^2 = y^2$ in 3–space.

3. Find the work done by the force $\mathbf{F} = 2\mathbf{i} - 5\mathbf{j}$ pounds in moving an object from $(2,1)$ to $(5,9)$, distance is measured in feet.

4. (There is no partial credit for this problem. Make sure your answer is correct.) Find the equation of the plane through $(1,1,1)$, $(2,2,3)$, and $(3,5,6)$.

5. Let $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j}$ and $\mathbf{b} = 8\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$. Compute $\mathbf{a} \times \mathbf{b}$.

6. Let $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j}$ and $\mathbf{b} = 2\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$. Find the angle between $\mathbf{a}$ and $\mathbf{b}$.

7. Find the vector of length 3 which has the same direction as $\mathbf{b} = 3\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$.

8. (There is no partial credit for this problem. Make sure your answer is correct.) Let $\mathbf{a} = -2\mathbf{i} + 4\mathbf{j}$ and $\mathbf{b} = 2\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$. Find vectors $\mathbf{u}$ and $\mathbf{v}$ with $\mathbf{b} = \mathbf{u} + \mathbf{v}$, $\mathbf{u}$ parallel to $\mathbf{a}$, and $\mathbf{v}$ perpendicular to $\mathbf{a}$.

9. Find the distance between $3x + 1y + 3z = 6$ and $3x + 1y + 3z = 10$.

10. Find the point on $(x - 1)^2 + (y - 2)^2 + (z - 3)^2 = 9$ which is closest to $2x + 3y + 4z = 1000$. 