There are 10 problems. Each problem is worth 10 points. SHOW your work. $\boxed{CIRCLE}$ your answer. **NO CALCULATORS!**

1. Find the equation of the plane which contains $(0, 0, 0)$, $(1, 1, 1)$, and $(2, 3, 4)$. Be sure to check your answer.

2. Find the equations of the line which contains $(1, 2, 4)$ and $(7, 8, 9)$. Be sure to check your answer.

3. What is the distance from $(1, 1)$ to $3x + 2y = 1$?

4. Let $\vec{u} = 2\vec{i} + 3\vec{j}$ and $\vec{v} = \vec{i} + 2\vec{j} + 3\vec{k}$. Find vectors $\vec{c}$ and $\vec{d}$ so that $\vec{c} + \vec{d} = \vec{u}$, $\vec{c}$ is parallel to $\vec{v}$, and $\vec{d}$ is perpendicular to $\vec{v}$. Be sure to check your answer.

5. Write $z = x^2 - y^2$ in sperical coordinates.

6. Draw three level sets for $f(x, y) = \sqrt{100 - x^2 - y^2}$.

7. Find $\lim\limits_{x \to 0} \frac{\cos x - 1}{x^2}$.

8. Find $\lim\limits_{(x,y) \to (0,0)} \frac{xy}{x^2 + y^2}$. (If the limit does not exist, be sure to explain why it does not exist.)

9. Find $\lim\limits_{(x,y) \to (0,0)} \frac{xy}{x^2 + y^2 + 2}$. (If the limit does not exist, be sure to explain why it does not exist.)

10. Find the intersection of $\frac{x+2}{3} = \frac{y-3}{4} = z + 1$ and $x - 2y + 3z + 7 = 0$. Be sure to check your answer.