

Math 241, Exam 1, Fall, 2022

You should KEEP this piece of paper. Write everything on the **blank paper provided**. Return the problems **in order** (use as much paper as necessary), use **only one side** of each piece of paper. Number your pages and write your name on each page. Take a picture of your exam (for your records) just before you turn the exam in. I will e-mail your grade and my comments to you. I will keep your exam. **Fold your exam in half** before you turn it in.

The exam is worth 50 points. Each problem is worth 10 points. **Make your work coherent, complete, and correct.** Please CIRCLE your answer. Please **CHECK** your answer whenever possible.

The solutions will be posted later today.

No Calculators, Cell phones, computers, notes, etc.

- (1) Find an equation for the plane through the points $P_1 = (1, 2, 3)$, $P_2 = (1, 1, 1)$, and $P_3 = (-1, 0, 1)$. **Check your answer. Make sure it is correct.**
- (2) Express $\vec{v} = 4\vec{i} + 5\vec{j}$ as the sum of a vector parallel to $\vec{w} = 2\vec{i} + 5\vec{j}$ and a vector orthogonal to \vec{w} . **Check your answer. Make sure it is correct.**
- (3) Name, describe, and graph the set of all points in three-space which satisfy both equations $x^2 + y^2 + z^2 = 4$ and $x^2 + y^2 = 1$.
- (4) Find the center and radius of the sphere $9x^2 - 6x + 9y^2 + 6y + 9z^2 - 6z = 1$.
- (5) Find the point on the plane $2x + 3y - 7z = 1$ which is closest to the point $(-3, -4, 15)$.