Math 241,   Exam 1,   Spring, 2020

Write everything on the blank paper provided. **You should KEEP this piece of paper.** If possible: return the problems in order (use as much paper as necessary), use only one side of each piece of paper, and leave 1 square inch in the upper left hand corner for the staple. If you forget some of these requests, don't worry about it – I will still grade your exam.

The exam is worth 50 points. Each problem is worth 10 points. Please make your work coherent, complete, and correct. Please $\boxed{CIRCLE}$ your answer. Please **CHECK** your answer whenever possible.

The solutions will be posted later today.

The exams will be returned on Monday.

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

(1) Find a system of parametric equations for the line through the points $P_1 = (7, 4, -2)$ and $P_2 = (1, -4, 1)$. **Check your answer. Make sure it is correct.**

(2) Find an equation for the plane through the points $P_1 = (2, 3, 4)$, $P_2 = (3, 4, 5)$, and $P_3 = (1, 6, 8)$. **Check your answer. Make sure it is correct.**

(3) Express $\overrightarrow{v} = 1\overrightarrow{i} - 2\overrightarrow{j}$ as the sum of a vector parallel to $\overrightarrow{b} = 3\overrightarrow{i} + 4\overrightarrow{j}$ and a vector orthogonal to $\overrightarrow{b}$. **Check your answer. Make sure it is correct.**

(4) Parameterize the intersection of the two planes

$$2x + 5y + 2z = 3 \quad \text{and} \quad 1x + y + 2z = 2.$$

Check your answer. Make sure it is correct.

(5) Describe, name, and draw the set of all points in 3-space that satisfy both of the equations $x^2 + y^2 + z^2 = 25$ and $z = 4$.