Math 241, Exam 1, Fall 2019

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 $P_1 = (1, 2, 3)$ and $P_2 = (7, 11, -1)$. **Check your answer. Make sure it is correct.**

(2) Find an equation for the plane through the points $P_1 = (1, 2, 3)$, $P_2 = (-1, 0, 2)$, and $P_3 = (3, 1, 5)$. **Check your answer. Make sure it is correct.**

(3) Express $\overrightarrow{v} = \overrightarrow{i} + 2\overrightarrow{j}$ 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) Find the point on the plane $5x + 3y - 7z = 73$ which is closest to the point $(1, 2, 3)$.

(5) Write $4x^2 + 9y^2 + 36z^2 - 8x - 36y + 216z + 328 = 0$ in the form

$$\frac{(x - x_0)^2}{a^2} + \frac{(y - y_0)^2}{b^2} + \frac{(z - z_0)^2}{c^2} = 1,$$

where x_0, y_0, z_0, a, b, and c are numbers.