Math 241, Exam 1, Fall, 2018

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 Tuesday.

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

(1) Find a system of parametric equations for the line through the points $P_1 = (2, 3, -1)$ and $P_2 = (1, -1, 1)$. **Check your answer. Make sure it is correct.**

(2) Find an equation for the plane through the points $P_1 = (3, 4, 5)$, $P_2 = (-1, 5, 7)$, and $P_3 = (1, 6, 8)$. **Check your answer. Make sure it is correct.**

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

(4) The set of all points on 3-space which satisfy $3x^2 - 6x + 3y^2 - 12y + 3 = 0$ is circular cylinder. What is the radius of this cylinder? What are the equations of the line in the center of the cylinder?

(5) What kind of geometric object is the intersection of the set of all points in 3-space which satisfy $x + y + 3z = 6$ and the set of all points in 3-space which satisfy $2x + y + z = 3$? Parameterize this object.