

Math 241, Exam 2, 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 CIRCLE your answer. Please **CHECK** your answer whenever possible.

The solutions will be posted later today.

The exams will be returned on Wednesday.

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

(1) Find the point on the plane  $x + 2y + 3z = 25$  which is closest to the point  $(\frac{11}{2}, 0, \frac{27}{2})$ .

(2) Write  $4x^2 + 9y^2 + z^2 - 8x + 36y - 6z + 13 = 0$  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.

(3) Describe, graph, and name the graph of  $y^2 - x^2 - z^2 = 1$  in 3-space.

(4) An object starts at the origin with velocity  $4\vec{i} + 8\vec{j}$ . The acceleration of the object at time  $t$  is  $\vec{r}''(t) = 2e^t\vec{i} + 16e^{2t}\vec{j}$ . What is the  $x$ -coordinate of the object when the  $y$ -coordinate is 12?

(5) Find the equations of the **LINE** normal to  $z = x^2 + y^2$ , when  $x = 1$  and  $y = 2$ .