

Math 241, Exam 2, 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  $P_1 = (2, 4, 5)$ ,  $P_2 = (1, -2, 4)$ , and  $P_3 = (3, 2, 1)$ . **Check your answer. Make sure it is correct.**

(2) Put  $2x^2 - 4x + 3y^2 - 12y + 4z^2 + 8z + 2 = 0$  in the form

$$A(x - x_0)^2 + B(y - y_0)^2 + C(z - z_0)^2 = D,$$

where  $x_0, y_0, z_0, A, B, C,$  and  $D$  are numbers.

(3) Name, describe, and graph the set of all points in three-space which satisfy  $x^2 + y^2 - z^2 = 1$ .

(4) An object travels on the  $xy$ -plane. The position vector,  $\vec{r}(t)$ , of the object satisfies

$$\vec{r}''(t) = 8e^{2t}\vec{i} + e^t\vec{j}$$

$$\vec{r}'(t) = 4e^{2t}\vec{i} + e^t\vec{j}$$

$$\vec{r}'(0) = 4\vec{i} + \vec{j}$$

$$\vec{r}(0) = 2\vec{i} + \vec{j}.$$

What is the  $x$ -coordinate of the object when the  $y$ -coordinate is 3?

(5) Let  $f(x, y) = \sqrt{x \cos(2xy) + 3x^2y^3}$ . Find  $\frac{\partial f}{\partial x}$ .