

Math 241, Exam 3, Fall, 2020

Write everything on the blank paper that you brought. There should be nothing on your desk except this exam, the blank paper that you brought, and a pen or pencil. When you are finished, put the problems in order and send a picture of your solutions to

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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.

- (1) Is there a plane that contains the lines

$$\begin{cases} x = -t + 5 \\ y = 2t + 1 \\ z = -t - 1 \end{cases} \quad \text{and} \quad \begin{cases} x = -5t - 4 \\ y = -2t + 1 \\ z = 3t + 2 \end{cases}$$

If there is, then find its equation. **Please make sure that your answer is correct.**

- (2) An object moves in three space. At time t , the position vector of the object is $\vec{r}(t) = e^{2t}\vec{i} + (2t^2 + 3)\vec{j} + t^3\vec{k}$. What are parametric equations for the line tangent to the path of the object at $t = 1$?
- (3) An object moves in three space. At time t , the position vector of the object is $\vec{r}(t) = t\vec{i} + t^{3/2}\vec{j}$. How far does the object travel between $t = 0$ and $t = 4$?
- (4) Find the local maximum points, local minimum points, and saddle points of $f(x, y) = x^2y + 4xy - 2y^2$.
- (5) Find the absolute extreme points of the function $f(x, y) = x + y - xy$, which is defined on the closed triangle with vertices at $(0, 0)$, $(0, 2)$, and $(4, 0)$.