NAME: **Section:**

MATH 251 Dr. Z. , Third Make-Up Practice Exam I

1. Find an equation for the plane that is parallel to the line joining $(2, 2, 0)$ and $(2, 0, 2)$ as well as to the line joining $(0, 0, 0)$ and $(1, 1, 1)$.

2. Find parametric equations for the *line segment* joining $(1, 1, 1)$ and $(2, 3, 4)$.

3. Find the curvature of the curve

$$\mathbf{r}(t) = \langle\, t\,,\, e^t\,, e^{2t} \rangle \quad .$$

4. What is the velocity and acceleration of a particle at time $t = 1$ if its position function is

$$\mathbf{r}(t) = \langle \sin 2t, \cos 2t, e^{2t} \rangle \quad .$$

5. Find the following limit, if it exists, or show that it does not exist:

$$\lim_{(x,y)\to(0,0)} \frac{1}{(x^2+y^2)} \quad .$$

6. Find the linear approximation to the function

$$f(x, y, z) = (\sqrt{x + 2y + 4z})^3$$

at the point $(3, 1, 1)$.

7. Use the chain rule to find $\frac{\partial w}{\partial s}$ and $\frac{\partial w}{\partial t}$, if

$$w = \sin(x + y + z) \quad , \quad x = st \quad , \quad y = s^2 t^2 \quad , \quad z = s^3 t^3 \quad ,$$

at $s = 0, t = 2$.

8. Find the maximum rate of change of $f(x, y, z) = e^{x^3+y^3+z^3}$ at the point $(1, 1, 1)$, and the direction in which it occurs.

9. Use implicit differentiation to find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if

$$\sin(x + y + z) = 3 + \cos(x + y + z)$$

10. Find an equation of the tangent plane to the surface

$$z = \cos(x + y)$$

at the point $(\pi/4, \pi/4, 0)$.