NAME: **Section:**

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

1. Find an equation for the plane that is perpendicular to the line joining $(2, 2, 0)$ and $(2, 0, 2)$ and passese through $(1, 1, 1)$.

2. Find symmetric equations for the line perpendicular to the plane $x + y + z = -4$ and that passes through the point $(1, -1, -2)$.

3. Find the curvature of the curve

$$\mathbf{r}(t) = \langle\, t^2\,,\, t^3\,, t^4 \rangle \quad ,$$

at the point where $t = 1$.

4. What force is required so that a particle of mass 100 g has the position function

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

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

$$\lim_{(x,y)\to(0,0)} \frac{x^9}{(x^2+y^2)^2} \quad .$$

6. Find the linear approximation to the function

$$f(x, y, z) = e^{x^2+y^2+z^2}$$

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

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

$$w = xy^2z^3 \quad , \quad x = st^2 \quad , \quad y = s^2 \cos t \quad , \quad z = s \sin 2t \quad ,$$

8. Find the maximum rate of change of $f(x, y, z) = \sin(x^2 + y^2 + z^2)$ at the point $(0, 0, \sqrt{\pi})$, 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

$$e^{x+y+z} - xyz = 5 \quad .$$

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

$$x^5 + y^5 + z^5 = 3$$

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