NAME: **Section:**

MATH 251 Dr. Z.'s First Make-Up Practice Exam I

1. Find an equation for the plane that passes through the points

$$(1,1,1) \quad , \quad (1,2,3) \quad , \quad (3,2,1) \quad .$$

2. Find parametric equations for the line through the point $(1, 2, 0)$ that is parallel to the plane $x + 2y + 4z = 7$ and perpendicular to the line $x = 1 + t, y = 1 - t, z = 2t$.

3. Find the curvature of the curve

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

at the point $(0, 1, 0)$.

4. What force is required so that a particle of mass 20 kg has the position function

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

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

$$\lim_{(x,y)\to(0,0)} \frac{x^2+5y^2}{(x+3y)^2} \quad .$$

6. Find the linear approximation to the function

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

at the point $(2, 2, 1)$, and use it to approximate $f(2.1, 1.9, 0.9)$.

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

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

when $s = 2$ and $t = 0$.

8. Find the maximum rate of change of $f(x, y, z) = \sqrt{x + y + z}$ at the point $(1, 2, 1)$, 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

$$1 + xyz = x^2 + y^2 + z^5 \quad .$$

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

$$z = e^{x+y}$$

at the point $(2, -2, 1)$.