NAME: **Section:**

MATH 251 (1-3), Dr. Z. , Mid-Term #1, 10:20-11:40 , Thu., Oct. 12, 2006

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

$$(2,2,0) \quad , \quad (2,0,2) \quad , \quad (0,2,2) \quad .$$

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

3. Find the curvature of the curve

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

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

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

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

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

$$\lim_{(x,y)\to(0,0)} \frac{x^4 + 5y^4}{(x^2 + 3y^2)^2} \quad .$$

6. Find the linear approximation to the function

$$f(x, y, z) = \frac{1}{\sqrt{x + y + z}}$$

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

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

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

when $s = 1$ and $t = 0$.

8. Find the maximum rate of change of $f(x, y, z) = x^2y^3z^4$ 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

$$xz = \ln(y + z) \quad .$$

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

$$z = e^{x^3+y^3}$$

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