NAME: **Section:**

Dr. Z.'s Fifth Practice Make-Up Exam I

1. Are the following two lines

$$x = t, y = 2t, z = 3t$$

and

$$x = t, y = 4 + t, z = 16 - t$$

intersecting, parallel or skew? If they are intersecting find an equation for the plane that contains both of them.

2. Determine whether the planes are parallel, perpendicular or neither. If neither find the angle between them.

$$x + y + z = 1 \quad , \quad 4x + 4y + 4z = 90 \quad .$$

3. Find the arclength of the curve

$$\mathbf{r}(t) = \langle\, 1\,t\,,\, \sin t\,,\, \cos t\,\rangle \quad , \quad 0 \leq t\pi/4 \quad .$$

4. A particle of mass 1 kg is moving thanks to a force

$$\mathbf{F} = \langle 0, 0, 1 \rangle \quad .$$

At $t = 0$, it is at the point $(0, 0, 0)$ moving at a velocity $\langle 1 , 1 , 1 \rangle$. Find its position at $t = 10$.

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

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

6. Find an equation for the tangent plane of the surface

$$e^{x+y+z} - e^3 xyz + xyz - 1 = 0$$

at $(1, 1, 1)$.

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

$$w = x^3 + y^2 z \quad , \quad x = t^3 - s^3 \quad , \quad y = s^3 - t^2 \quad , \quad z = t^3 + s^4.$$

8. Find the directional derivative of the function

$$g(x, y, z) = (1 + x + 2y + 2z)^{-3/2}$$

at the point $(0, 0, 0)$, in the direction of the vector $\langle 1, -1, 1 \rangle$.

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

$$xyz + e^{xyz} = 1 + e \quad ,$$

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

10. Find the linearization, $L(x, y, z)$, of

$$f(x, y) = e^x \cos(x + y + z)$$

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