NAME: **Section:**

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

1. Find an equation for the plane that passes through the point $(0,0,0)$ and contains the line of intersection of the planes

$$x + y + z = 3 \quad , \quad 2x + y + z = 4 \quad .$$

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

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

3. Find the arclength of the curve

$$\mathbf{r}(t) = \langle \sqrt{2}\,t \,,\, e^{t} \,,\, -e^{-t} \rangle \quad , \quad 1 \leq t \leq 2 \quad .$$

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

$$\mathbf{F} = \langle 2, 6t, 12t^2 \rangle \quad .$$

At $t = 0$, it is at the point $(1, 1, 1)$ moving at a velocity $\langle 2 , 3 , 4 \rangle$. Find its position at $t = 2$.

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

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

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

$$z = \sqrt{x + y}$$

at $(2, 2, 2)$.

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

$$w = x^3 y^2 z^2 \quad , \quad x = s^2 t^2 + 1 \quad , \quad y = t^2 s + 3t \quad , \quad z = t^3 s.$$

8. Find the directional derivative of the function

$$g(x, y, z) = (x + 2y - 2z)^{7/2}$$

at the point $(1, 1, 1)$, in the direction of the vector $\langle 3, 4, 0 \rangle$.

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

$$x^3 + y^3 + z^3 = 3xyz + 7 \quad .$$

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

$$f(x, y) = \cos(3x - 2y + 3z)$$

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