Consider two intersecting lines

\[ L_1 : \quad x - 4 = -\frac{1}{2}y = \frac{1}{5}(z - 7) \]
\[ L_2 : \quad \frac{1}{2}x + 2 = \frac{1}{3}(y + 5) = -z \]

(a) [4 points] Find the intersection of \( L_1 \) and \( L_2 \).
(b) [4 points] Find the acute angle between \( L_1 \) and \( L_2 \).
(c) [5 points] Find the equation of the plane containing \( L_1 \) and \( L_2 \).
Problem 2: One particle is moving along the straight line \( \mathbf{r}_1(t) = (2\pi + t, 2t, 1 + t) \), and another one is moving along the helix \( \mathbf{r}_2(t) = (t, \sin(t), \cos(t)) \).

(a) [4 points] Would the particles collide?

(b) [4 points] Do their trajectories intersect?

(c) [5 points] Find the tangential and normal components of the acceleration of the second particle when it is at the point \((2\pi, 0, 1)\).
Problem 3:
Consider the function $z(x, y) = 4 - x^2 - y^2$.

(a) [4 points] Sketch the surface represented by $z(x, y)$. Determine if $z(x, y)$ is continuous at $(x_0, y_0) = (1, 0)$.

(b) [5 points] Compute $z$, $\frac{\partial z}{\partial x}$, and $\frac{\partial z}{\partial y}$ at the point $(x_0, y_0) = (1, 0)$.

(c) [5 points] Use linear approximation to estimate $z(1, 0.1)$, and compare your approximation with the exact value.