1. Let $l$ be the line passing through $P(0, 0, 1)$ and $Q(2, 1, 0)$. Find the intersection point of $l$ with the plane $4x - y + 5z = 9$.

2. Find the equation of the trace (cross-section) of the surface $4x^2 - y^2 + z^2 = 4$ on the plane $z = 2$, and describe it.

3. Sketch the $k$-level curves of the function $f(x, y) = \sqrt{x - y^2 + 1}$ for $k = 0, 1, 2$.

4. Determine whether or not the following limits exist.
   (a) $\lim_{(x,y) \to (0,0)} \frac{x \sin y^2}{x^2 + y^2}$.
   (b) $\lim_{(x,y) \to (0,0)} \frac{x^2 \sin y^2}{x^2 + y^2}$.