1. Sketch level curves of the function \( f(x, y) = xy \) at levels \( 0, \pm 1, \pm 2 \). Can you identify and sketch the graph of \( f \)?

2. The equation \( x^2 + y^2 - z^2 = 0 \) (cone), \( x^2 + y^2 - z^2 = 1 \) (hyperboloid of 1 sheet), and \( x^2 + y^2 - z^2 = -1 \) (hyperboloid of 2 sheets) cannot be realized as functions. But we can still sketch the graph using the same techniques. Follow the instruction below and sketch the graph for them.

   (a) For \( x^2 + y^2 - z^2 = 0 \) (cone), sketch of the level curves at levels \( z = 0, z = \pm 1, z = \pm 2 \). Notice that all level curves are circles. What’s the rate of change of radius in terms on the \( z \)-value? Can you recover the surface from level sets? What is the intersection of the surface with \( yz \)-plane (when \( x = 0 \))? 

   (b) For \( x^2 + y^2 - z^2 = 1 \) (hyperboloid of 1 sheet), sketch of the level curves at levels \( z = 0, z = \pm 1, z = \pm 2 \). Again all level curves are circles. Can you recover the surface from level sets? What is the intersection of the surface with \( yz \)-plane (when \( x = 0 \))? 

   (c) For \( x^2 + y^2 - z^2 = -1 \) (hyperboloid of 2 sheet). What the range for \( z \)-value? Sketch of the level curves at levels \( z = \pm 1, z = \pm 2, z = \pm 3 \). Can you recover the surface from level sets? What is the intersection of the surface with \( yz \)-plane (when \( x = 0 \))?
3. Find the graph and level sets for the following functions

\[ f(x, y) = e^x \cos y \quad g(x, y) = \frac{x - y}{1 + x^2 + y^2} \quad h(x, y) = \sin(xy) \]