1. Let \( f(x, y) = xy^2 + y \cos(x - 1); \quad R : \ |x - 1| \leq 0.1, \ |y - 2| \leq 0.1. \)
   a) Find the linearization \( L(x, y) \) of \( f(x, y) \) at \( P_0(1, 2) \).
   
   b) Find an upper bound for the magnitude \( |E| \) of the error in the approximation
   \( f(x, y) \approx L(x, y) \) over the rectangle \( R \).

2. About how accurately may \( V = pr^2h \) be calculated from measurements of \( r \) and \( h \) that
   are in error by 1%?
3. Let \( f(x, y) = \frac{1}{x} + xy + \frac{1}{y}. \) Find any local maxima, local minima and saddle points.

4. Let \( f(x, y) = 4x - 8xy + 2y + 1 \) on the triangular plate bounded by the lines \( x = 0, y = 0, \) and \( x + y = 1 \) in the first quadrant.
5. Find the points on the curve \( x^2 + xy + y^2 = 1 \) in the \( xy \)-plane that are nearest and farthest from the origin.

6. Find the points on the sphere \( x^2 + y^2 + z^2 = 25 \) where \( f(x, y, z) = x + 2y + 3z \) has its maximum and minimum.
7. Find the maximum value of \( w = xyz \) on the line of intersection of the two planes \( x + y = 40 \) and \( x + y + z = 0 \).

8. Let \( w = x^2 + y^2 + z^2 \) and \( y \sin z + z \sin x = 0 \).
   a) Find \( \left( \frac{\partial w}{\partial x} \right) \) at the point \((x, y, z) = (0, 1, \pi)\).
   b) Find \( \left( \frac{\partial w}{\partial z} \right) \) at the point \((x, y, z) = (0, 1, \pi)\).