1. Use the contour plot of \( f(x,y) = 3x - x^3 - 2y^2 + y^4 \) to identify local min, max, or saddle points if any.

   (Note: There are six critical points)

2. Find all max, min, and saddle points for
   
   a) \( f(x,y) = 9 - 2x + 4y - x^2 - 4y^2 \)
   
   b) \( g(x,y) = x^3 y + 12x^2 - 9y \)

3. Find the local max, min, and saddle points, if any, for \( f(x,y) = x^4 + y^4 - 4xy + 1 \).
   
   Visualize your answer by drawing the surface and/or contour plot in Maple.
   
   (Note: There are three critical points)
1) Use Maple to draw the surfaces (contour plots) for the following functions and guess any max, min, and saddle points:

a) \( f(x,y) = x^2 + y^2 + x^2y^2 \)

b) \( g(x,y) = x^4 - 5x^2 + y^2 + 3x + 2 \)

2) Continuous functions of one variable can not have two local max without having a local min. For two-variable functions this is different. Show that

\[ f(x,y) = -(x^2 - 1)^2 - (x^2 - y - 1)^2 \]

has only 2 critical points, both of which are max. Use Maple to visualize the function.

3) Find the point on the plane \( x - y + z = 4 \) closest to \((1,2,3)\).

4) Find three positive numbers whose sum is 100 and whose product is max.

5) Find the rectangular box with largest volume and total surface area of 64 cm².