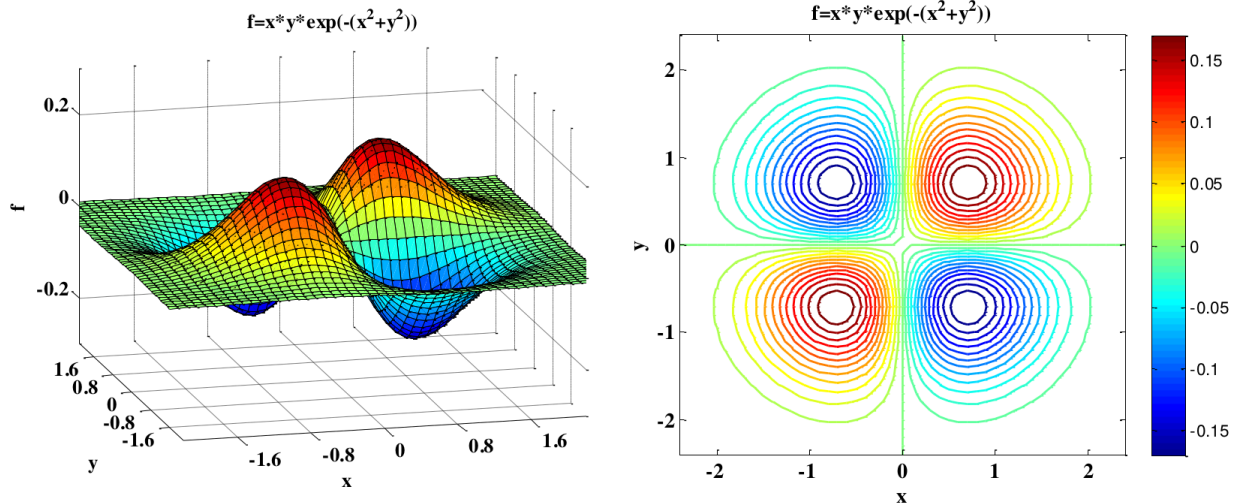1. Find all the critical points for $f(x, y) = xy \exp[-(x^2+y^2)]$ and classify each as yielding a relative maximum, a relative minimum, a saddle point, or none of these.

   The 3D & contour plots:

2. A silo is in the shape of a right-circular cylinder surmounted by a right-circular cone. If the radius of each is 6 m and the total surface area must be 200 m². (Not including the base), what heights for the cone and cylinder yield maximum enclosed volume?

   12 m
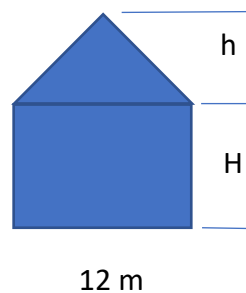
3. A Cobb-Douglas production function has the form $P(x,y) = k\, x^q\, y^{1-q}$, where P is the number of items produced per unit time, x is the number of employees, and y is the operating budget for that time. The numbers k>0 and 0<q<1 are constants. Find the least-squares estimates for k and q for the following production data.

Workers, x	100	110	90	100	95	105	110
Budget, y ($)	10000	9000	9000	12000	11000	9500	10000
Production, P	800	810	720	860	810	800	850