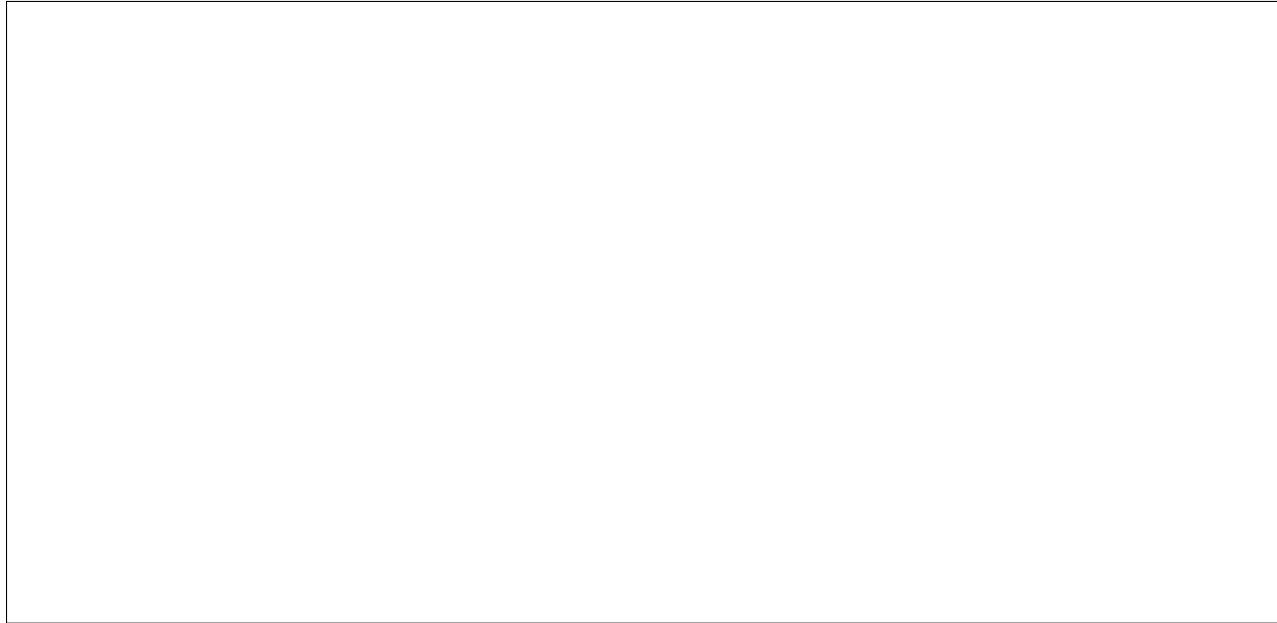# Lesson 33. Constrained Optimization

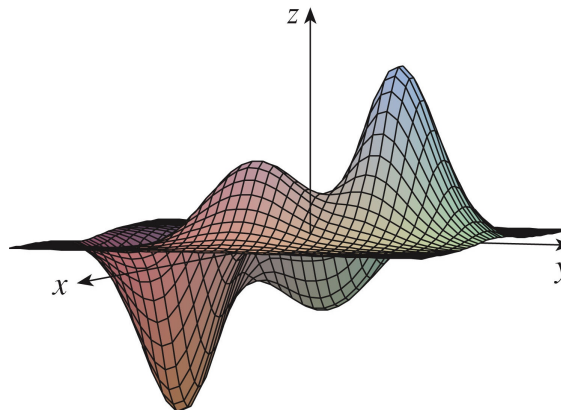## 0   Review

Example 1. Find the local maxima and minima and saddle points of $f(x, y) = (x^2 + y)e^{y/2}$.
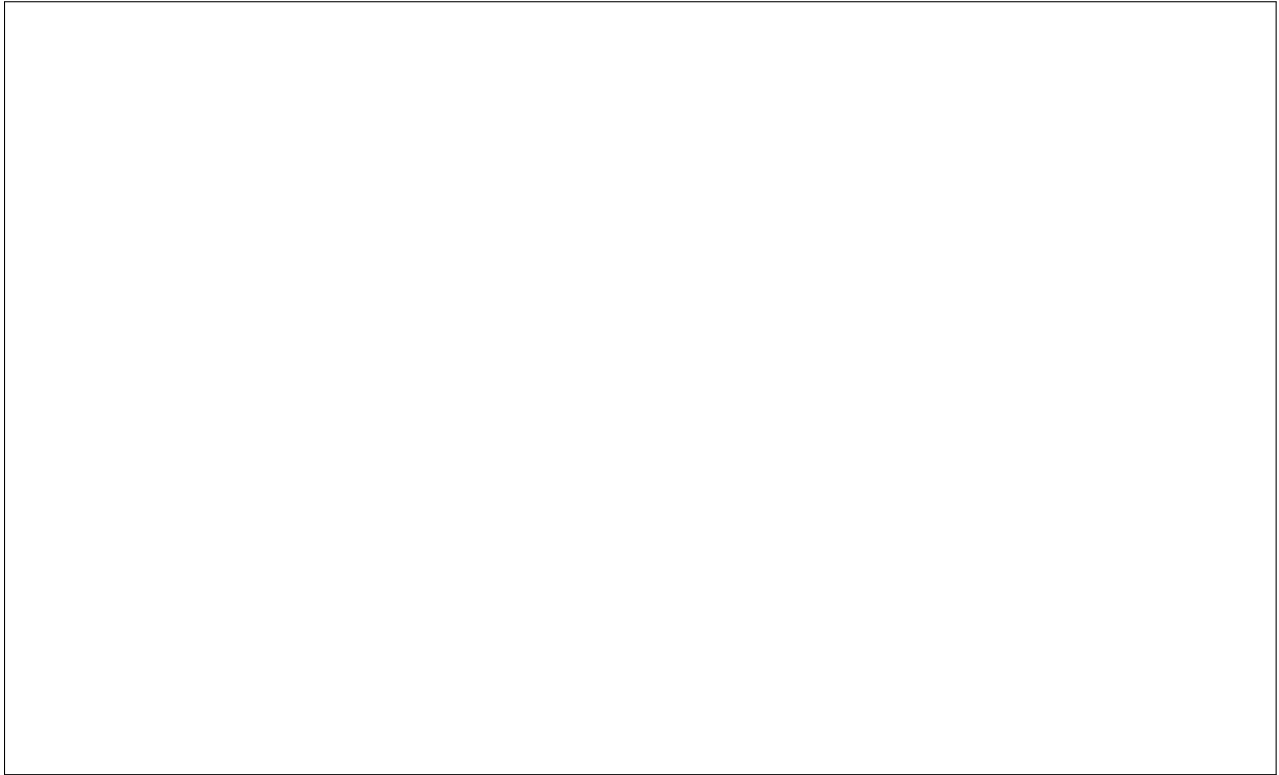
1   Absolute minima and maxima

- (a, b) is an **absolute minimum** if $f(a, b) \leq f(x, y)$ for all (x, y) in the domain of f

- (a, b) is an **absolute maximum** if $f(a, b) \geq f(x, y)$ for all (x, y) in the domain of f

- Every absolute minimum is a local minimum

- However, a local minimum is not necessarily an absolute minimum!

- Same statements apply for absolute/local maxima

2   Optimization with 1 equality constraint

Example 2. Find the shortest distance from the point $(1, 0, -2)$ to the plane $x + 2y + z = 4$.

Example 3. A rectangular box is to be made from 12 m^2 of cardboard. Find the maximum volume of such a box.

Example 4. Find the maximum volume of a rectangular box inscribed in a sphere of radius 1.