MATHEMATICS II
Thursday April 19 2018
Seventh Exercise Class

1. Decide if the following function are differentiable at the specified point.

   a) $f(x, y) = xe^{x,y}$, $(x, y) = (1, 0)$.

   b) $f(x, y) = \sqrt{x^2 + y^2}$, $(x, y) = (0, 0)$.

   c) $f(x, y) = \begin{cases} \frac{xy^2}{\sqrt{x^4 + y^4}}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$

2. Find local maxima, local minima and saddle point of the following functions.

   a) $f(x, y) = e^{x^2 + y^2}$.

   b) $f(x, y) = e^{x^2 - y^2}$.

   c) $f(x, y) = \log(xy) - x - y$.

   d) $f(x, y) = \log(xy) - x^2 - y^2$.

   e) $f(x, y, z) = 2x^2 - y^2 - z^2 + 2xz - 2x - 2z$.

   f) $f(x, y, z) = e^{x^2 + y^2 - z^2}$.

3. Find the maximum and the minimum values of f subject to the given constraint.

   a) $f(x, y) = x^2 + 2xy - y^2$ on $2x + 3y = 0$.

   b) $f(x, y) = x - y$ on $x^2 + y = 2$

   c) $f(x, y) = x^2 + 2y$ on $y^2 = x$.

   d) $f(x, y) = y^3 - 3x$ on $x - y = 1$.

   e) $f(x, y, x) = x + y + z$ on $xyz = 1$.

   f) $f(x, y, x) = x^2 + y^2 + z^2$ on $\begin{cases} x + y = z \\ y + z = 1 \end{cases}$.