HW 5

Exercise 1. Find the terms up to order 2 in the Taylor formula of the following functions (taking P = (0,0)).

- $\sin(xy)$

- $\sin(x)\cos(y)$

Exercise 2. Find the terms up to order 2 in the Taylor formula of $\cos(x^2 + y)$ at $P = (0, \pi)$.

Exercise 3. Show that $f(x, y) = ax^2 + bxy + cy^2$ has the origin $(0, 0)$ as a critical point.

Exercise 4. Determine whether the following quadratic forms have a maximum, minimum, or saddle at the origin.

- $3x^2 - 4xy + y^2$

- $x^2 + 3xy + 4y^2$

- $-x^2 + 2xy - y^2$

Exercise 5. Find the critical points of $f(x, y) = ye^{-(x^2+y^2)}$ and for each one, determine whether the point is a local min, max, or saddle.

Exericse 6. Use the single variable power series

$$\sin(x) = x - x^3/3! + \cdots$$

and

$$e^x = 1 + x + x^2/2 + \cdots$$

to find the terms up to order 2 in the Taylor formula at $P = (0, 0)$ of

- $\sin(xy)$

- e^{x+y}