Homework 4

Due February 16th in class or by 3:20 pm in MATH 602.

1. Compute the second-order Taylor formula of the function

$$f(x, y) = e^{x+y^2} \cos(x - y) + \sin(xy) + \sin(x^3 + y^3).$$

about $(0, 0)$.

Hint: Make use of the Taylor series

$$e^t = 1 + t + \frac{t^2}{2} + \frac{t^3}{6} + \cdots,$$

$$\sin t = t - \frac{t^3}{6} + \cdots, \qquad \cos t = 1 - \frac{t^2}{2} + \frac{t^4}{24} + \cdots.$$

2. For each of the following functions, find all the critical points, and decide if each one is a local maximum, a local minimum, or neither.

   (a) $f(x, y) = x^2 + xy - x + y^2 + 4y + 7$.

   (b) $f(x, y) = x^4 + y^{10}$.

   (c) $f(x, y) = -x^6 - y^8$.

   (d) $f(x, y) = x^4 + y^3$.

   (e) $f(x, y) = x^7 y^6$.