# Homework Assignment for Week 11

1. Section 14.7: Problems 31, 35, 43, 44.

   Hint: You can use the method of gradient analysis introduced in 190430's class. That is, plot the gradient vector $\nabla f$ near a critical point to determine whether the critical point is a local minimum, local maximum or neither.

2. Section 14.8: Problems 1, 23, 27, 33, 35.

3. Section 14.9: Problems 7, 9, 10, 11.

   Hint: An alternative method for problem 10, 11: try Taylor's formula for $\frac{1}{1-z}$ with appropriate choice of $z$. For problem 11: read example 1 in page 840.

4. Section 14.9:

   Taylor's formula for functions of 2 variables can be summarized as

$$f(x_0 + \Delta x, y_0 + \Delta y) = f(x_0, y_0) + \sum_{k=1}^{n} \frac{1}{k!} \Big(\Delta x \partial_x + \Delta y \partial_y\Big)^k f(x_0, y_0)$$

$$+\frac{1}{(n+1)!} \Big(\Delta x \partial_x + \Delta y \partial_y\Big)^{n+1} f(x_0 + c\Delta x, y_0 + c\Delta y), \quad 0 < c < 1.$$

   (Note: the textbook uses the notations $a, b, h, k$ in place of $x_0, y_0, \Delta x, \Delta y$). Derive a similar formula for functions of 3 variables. Then use it to derive the error estimate $|E| < \cdots$ in page 816 (section 14.6).

5. Section 14.9:

   Use Taylor's formula for 2 variables to derive the formula $\Delta f = \Delta_1 + \Delta_2 + \Delta_3$ on page 5 of mse19s_190425.pdf.