Calculus II, Spring 2023 (http://www.math.nthu.edu.tw/~wangwc/)

Thomas' Calculus Early Transcendentals 13ed

Study guide for quiz 07

Quiz problems include both the lecture contents and homework problems.

1. Section 14.6: Review the definition and properties of the gradient vector and its application in finding the tangent plane and normal line at a point (x_0, y_0, z_0) on the level surface $F(x, y, z) = c$ of a differentiable function F. Review how to find the tangent line and normal plane at a point (x_0, y_0, z_0) on a curve in space defined as the intersection of two surfaces $F(x, y, z) = C_1$ and $G(x, y, z) = C_2$.

2. Section 14.6: Study and memorize the error estimate of $E(x, y) = f(x, y) - L(x, y)$ for a function $z = f(x, y)$ and its linearization $z = L(x, y)$ at a point (x_0, y_0).

3. Section 14.6: SKIP the 'differentuial' part on page 858, which reads:

$$df = f_x(x_0, y_0)dx + f_y(x_0, y_0)dy.$$

   Instead, you need to remember/understand that

$$\Delta f \approx f_x(x_0, y_0)\Delta x + f_y(x_0, y_0)\Delta y.$$

4. Section 14.7: Study the 'First Derivative Test', 'Second Derivative Test', how the sign of the determinant $f_{xx}f_{yy} - f_{xy}^2$ is related to whether $f_{xx}\Delta x^2 + 2f_{xy}\Delta x\Delta y + f_{yy}\Delta y^2$ can be rewritten as 'sum of squares' or 'difference of squares', which in term determines whether a critical point is local min, local max, or neither. Review the procedure of finding potential local minima and/or local maxima of a differentiable function $z = f(x, y)$.