

## Study guide for quiz 06

Quiz problems include both the lecture contents and homework problems.

1. Section 14.3:

Study and memorize the definition of differentiability for functions of two or more variables in section 14.3. Study why the four statements (1)-(4) on page 1 of Remark\_on\_definition\_of\_differentiability.pdf are identical.

2. Section 14.3:

Study how to evaluate  $f_{xy}(0, 0)$   $f_{yx}(0, 0)$  for problems like section 14.3, problem 72.

3. Section 14.4:

Study the Chain rule for composition of differentiable functions of one or more independent variables (along with one or more intermediate variables) such as Theorem 5 (1 independent, 2 intermediate variables), Theorem 6 (1 independent, 3 intermediate variables), Theorem 7 (2 independent, 3 intermediate variables) and so on for more general cases.

4. Section 14.4:

Study how to evaluate

$$\frac{d}{dx} \int_{u(x)}^{v(x)} g(t, x) dt.$$

Hint:  $= \frac{d}{dx} F(u(x), v(x), w(x))$  where  $F(u, v, w) = \int_u^v g(t, w) dt$ .

5. Section 14.5:

Study the definition of directional derivative and how to compute it from definition, and alternatively how to compute it using partial derivatives when the function is differentiable.

6. Section 14.5:

Study the geometric meaning of the gradient vector. Study how to find the tangent line and normal line of a level curve of  $f(x, y)$  (i.e.,  $\{(x, y) \mid f(x, y) = c\}$ ) using gradient of  $f$ .