Math 253 - Spring 2020 **Ch.12 Overview** **-Tsuchida**

12.1 Functions of two variables
- Distance formula in 3-D
- Equation of a sphere of
- Distance from a point to an axis, or from a point to a coordinate plane.
- Interpretation of functions of two variables (e.g. the drug concentration example)

12.2 Graphs of two-variable functions & Cross-sections
- Cross-Sections ("x-slices" and "y-slices")

12.3 Contour Diagrams
- Level curves ("z-slices")
- Be able to create contour diagrams
- Be able to read and interpret contour diagrams by
- Contour diagrams of linear functions
- Be able to match formulas z=f(x,y) to their 3D graphs
- Cylinders (not just the round kind)
- Functions that are "r-substitutions" are like surfaces of revolution from Calculus II
- Be familiar with graphs of functions such as:

$$z = x^2 + y^2, \quad z = \sqrt{x^2 + y^2}, \quad z = x^2 - y^2, \quad z = mx + ny + b$$

12.4 Linear Functions (planes)
- Tables of linear functions have a recognizable pattern
- Non-vertical Linear functions can be expressed in the form $z = mx + ny + b$
- Contour diagrams of linear functions have a recognizable pattern
- Be able to Graph a plane using the triangle method
- Given a plane graphed using the triangle method, find the equation of the plane.
- Given three "nice" points, find the equation of the plane containing them.

12.5 Functions of three variables
- Functions of three variables can be interpreted as having 4-dimensional graphs, but they can also represent normal "real world" situations such as: Temperature = T(x,y,z).
- Be able to represent z=f(x,y) as one particular level surface of a function g(x,y,z)
- The same way we can find 2-D <u>level curves</u> of a 3-D graph z=f(x,y), we can also find 3-d <u>level surfaces</u> of a 4-D graph of T=f(x,y,z)

12.6 Limits and Continuity
- Sums, Differences, Products, Quotients (where denominator is not zero) and Compositions (Where range of inner function stays within the domain of the outer function) of continuous functions are continuous functions.
- A function is <u>continuous</u> at a point (a,b) if $\lim_{(x,y)\to(a,b)} f(x,y) = f(a,b)$
- You can prove that a limit does <u>not</u> exist at (a,b) if you can find two paths approaching (a,b) that result in <u>different</u> limits.