

10 Limits and Continuity

(Section 2.2: 1 day)

Outcomes:

- A. Describe a delta neighborhood of a point in 2- or 3-space.
- B. Evaluate the limit of a function of several variables for a given approach or show that it does not exist.
- C. Determine whether a function is continuous at a given point. Interpret the definition of continuity of a function of several variables graphically.
- D. Determine whether a set in 2- or 3-space is open, closed or neither. Determine whether a set is compact.
- E. Recall and apply the Extreme Value Theorem.

Reading: Section 2.2

Homework: F1,1a,2bdgh,3bdf,8cd,F2,9,F3,10,F4

Outcome Mapping:

- A. F1
- B. 1a,2bdgh,3bdf
- C. 8cd,F4
- D. F3,10
- E. F2,9

Supplementary Problems:

- F1. A δ -neighborhood of a point \vec{x}_0 is the set of points $\{\vec{x} : \|\vec{x} - \vec{x}_0\| < \delta\}$.
- (a) Interpret in words what is meant by $\{\vec{x} : \|\vec{x} - \vec{x}_0\| < \delta\}$.
 - (b) Graph a $\frac{1}{2}$ -neighborhood of 3 in \mathbb{R} .
 - (c) Graph a 1-neighborhood of $(2, 3)$ in \mathbb{R}^2 .
 - (d) Graph a 2-neighborhood of $(1, 2, 3)$ in \mathbb{R}^3 .
- F2. Study the Extreme Value Theorem. State it from memory.
- F3. In each case identify whether the set is open, closed or neither.
- (a) $\{x \mid 0 \leq x \leq 1\}$
 - (b) $\{(x, y) \mid 1 < x^2 + y^2 < 2\}$
 - (c) $\{(x, y, z) \mid 1 < x^2 + y^2 < 2, z = 0\}$
- F4. Graphically illustrate a function of two variables that is continuous everywhere except on the positive and negative x -axes. (Note the the function must be continuous at the origin.)