Advanced Engineering Mathematics

Session I

(or the warm up)

Contents (What?)

- Linear Analysis, Hilbert Space => Functional Analysis
  - Why?
    - System-based point of view: signals and systems,
    - Physics-based point of view:

Contents

- Sturm-Liouville Operator Theory
  - Why?
    - Usually encountered in electromagnetic problems,
    - Gives us new sets of functions useful in spectral, pseudo-spectral methods

Contents

- Green’s Function Method
  - Why?
    - Gives us closed form analytic expressions
    - Spectral behavior of SL operators

Contents

- The Spectral Representation
  - Why?
    - Great physical importance
    - Mathematical importance in Green’s function representation

Contents

- Mathematical Modeling of Electromagnetic Sources,
- Spectra of Open/Closed Waveguides,

Approach (How?)

- Reasoning:
  - Plausible,
    - Why? => train of thought
  - Strong,
    - Why? => no Baconian idols, no Ockham’s razor
  - Aristotle vs. Euclid
  - How do we learn?

Approach

- Organism + Environment => Consciousness/Cognition

  Object => Sensation =>

  Perception

  +Recollection

  +Imagination

  => Concept, Idea

Approach

- Concept, Idea => Cognition/Consciousness
  - Emotional (organism's reaction)

    Inside
  - Scientific

    Outside

Music vs. Mathematics/Subjective or Objective?

Approach

- Math: the free creation of mind?
- Realism vs. Antirealism
- Einstein: "Physical concepts are the free creations of the human mind and are not, however it may seem, uniquely determined by the external world."
- Realism vs. Antirealism

Approach