What is a Database?

- Collection of Dynamic Data
  - Large
  - Persistent
  - Integrated
- With Some Operations
  - to Maintain the Data
  - to Retrieve the Data

What is a Database System?

- Provides Languages
  - DDL (Data-Definition Language)
    - Data Definition
    - Metadata
  - DML (Data-Manipulation Language)
    - Data Retrieval
    - Data Update
- Provides Services
  - Storage Structures (files, indexes, …)
  - Optimizers
  - Crash Recovery
  - Concurrency Control
  - Constraint Checking (integrity)

What is a Database Application?

- A Database with Application Programs
  - Runs on a Database System
  - Helps Satisfy End-User Business Needs
- Examples (of Application Areas)
  - Business & Decision Support
  - Design
  - Knowledge and Scientific
  - Multimedia

Database Application Development

- Software and Data Engineering
  - Basic Approach
    - Model application as objects and their relationships, behavior, and interactions
    - Transform application model to an efficient implementation
  - Concepts-and-Principles Approach
    - Theoretically sound and computationally complete model
      - Formal
      - Seamlessly across analysis, specification, design, and implementation
      - Language-equivalent
      - Ontological
    - Information- and constraint-preserving transformations