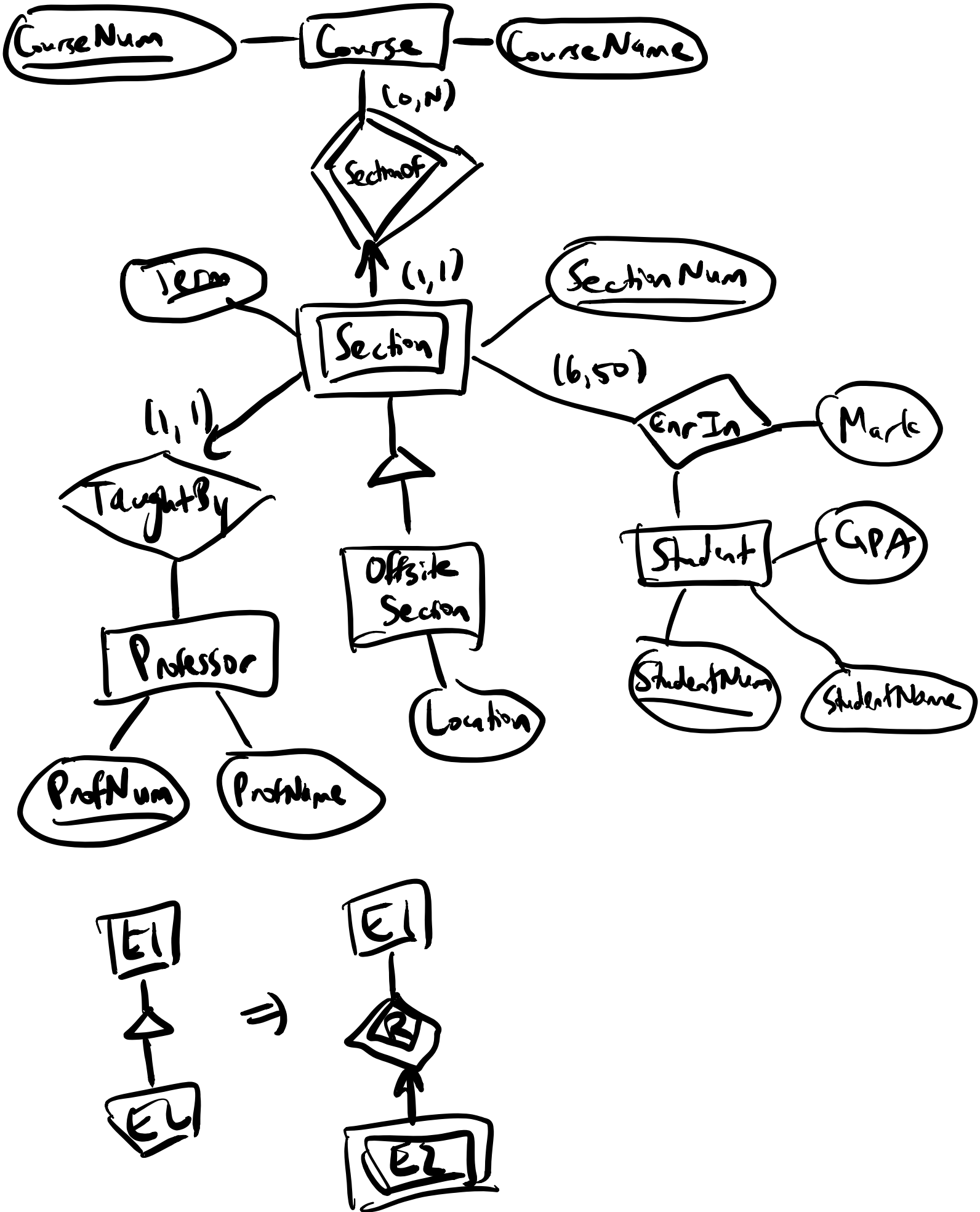
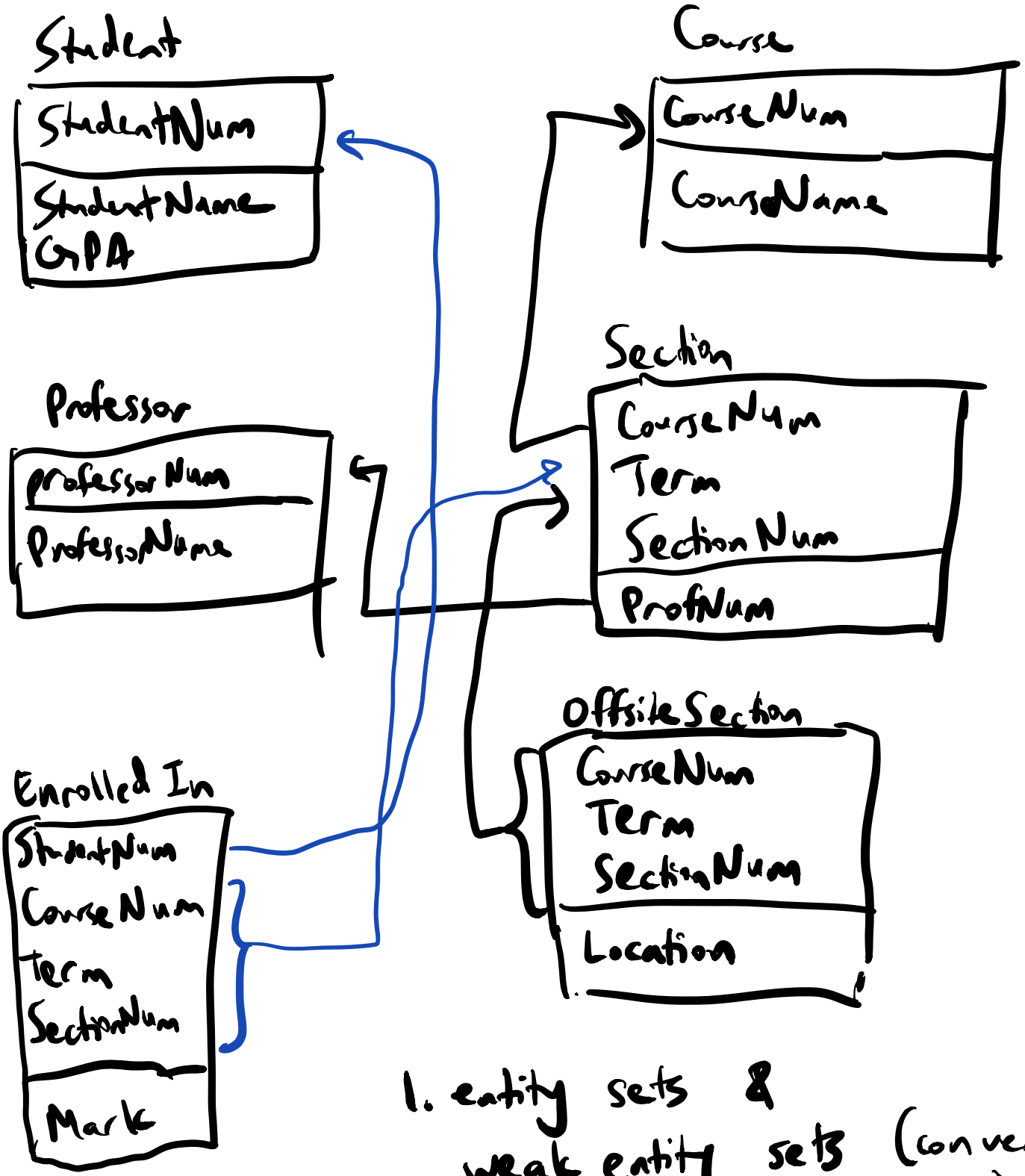
E-R schema → RDB schema





1. entity sets & weak entity sets (convert specialization to these!) & attribute sets
2. relationship sets

Inclusion dependency: More general version of FK constraint (subtuple constraints), not captured

in SQL standard

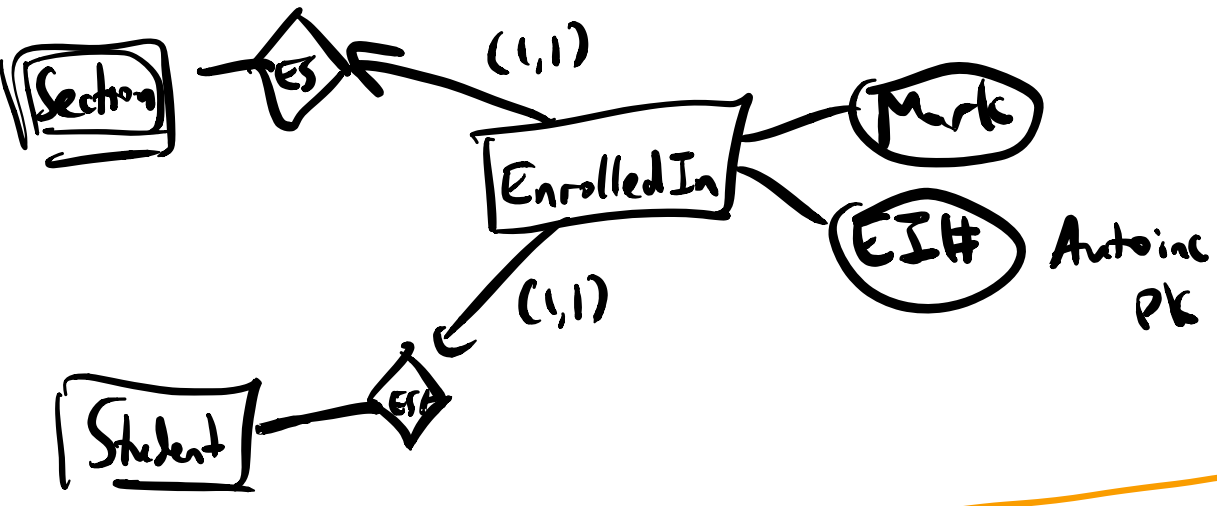
Data Definition in SQL (DDL)

CREATE TABLE <name> {... <attributes>,
PRIMARY KEY (< list of str >)
}

ALTER TABLE (DELETE) ADD COLUMN

Sidenote

Reification



Create table DEPT {
ID integer NOT NULL,
DeptName char(20),
MgrNo char(3),
PRIMARY KEY (id) }

↖ Needed for PKs
↳ Important for equality (coreferring)

INSERT INTO dept VALUES (1, 'CS', 000100)

Foreign Key

- specifies a referential constraint
- FOREIGN KEY (<attrs>)
  REFERENCES <ref-table> (<attrs>)
  ON DELETE <delete-action>
  ON UPDATE <update-action>

Actions:
- RESTRICT (error) → exception on COMMIT WORK (failure)
- CASCADE (propagate the delete) → adds more operations to transactions with tuple deletes
- SET NULL (set to "unknown")

↳ Revision/update + notion of a transaction

In CREATE TABLE {...}:

CHECK <condition>

e.g. CHECK (salary > 0)

→ exceptions on insert if violated

Views and View Management

Definition (View):

A view is a relation whose instance is determined by instances of other relations.

```
CREATE VIEW <view> [AS] (
    <query>
)
```

Many of the same properties as a table
- access controls can be applied
- schema info appears in the DB schema
- other views can be defined in terms of it
  ↳ but no recursion

Types of views

① Virtual: only used for querying, not stored
② Materialized: view constructed & stored in DB upon execution. → very general!

Updating views

- modifications to a view's instance must be propagated back to instances of relations in conceptual schema
- Some views cannot be updated unambiguously

(select distinct name, pastime from persons, pastimes where persons.citizenship = pastimes.citizenships)

↑ define view PersonalPastimes — External Schema

SQL-92: View updatable only if:

- query references exactly 1 table
- outputs simple attributes
- no grouping (...
- no nested query
- no set ops

→ These rules are more restrictive than necessary

Materialized Views

Problem: Base table changes → Materialized view may also need to change

→ Incremental View Update Problem

Solution?

- periodically reconstruct the view
- incrementally update the view (smaller deltas)

Data Control Language (DCL)

- assigns access rights to DB objects

- 2 levels: users and user groups

GRANT <what> ON <obj> TO <user(s)>

REVOKE " FROM "

- enabling DB admin to create external schema
- payroll group allowed to access relevant tables