

# CMSC424: Database Design

## Lecture 5

# Review: Relational Algebra

## Relational Algebra Operators

1. Select ( $\sigma$ )
2. Project ( $\pi$ )
3. Set Union ( $\cup$ )
4. Set Difference ( $-$ )
5. Cartesian Product ( $\times$ )
6. Rename ( $\rho$ )

These are called *fundamental* operations

# Relational Algebra

## *Redundant Operators*

1. Natural Join ( $\bowtie$ )
2. Division ( $\div$ )
3. Outer Joins ( $\leftarrow$ ,  $\rightarrow$ ,  $\bowtie$ ,  $\leftarrow$ ,  $\rightarrow$ )
4. Update ( $\leftarrow$ )