Why Are We Studying Matrices?

Matrices have plenty of uses in Computer Science. E.g.:

- Representation . . .
  - . . . of the graph data structure (see CSc 345)
  - . . . of functions and relations (see Topics 8 and 9)

- Affine transformations in Computer Graphics
**Matrix Fundamentals (1 / 3)**

**Definition:** Matrix

Notation:

**Matrix Fundamentals (2 / 3)**

**Definition:** Square Matrices

**Definition:** Matrix Equality
Matrix Fundamentals (3 / 3)

Definition: Transposition

Definition: Matrix Symmetry

Example(s):

Matrix Operations (1 / 5)

1. Matrix Addition

Definition: Matrix Addition

Example(s):
Matrix Operations (2 / 5)

2. Scalar Product

**Definition:** Scalar

**Definition:** Scalar Product

**Example(s):**

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Matrix Operations (3 / 5)

3. Matrix Product

**Definition:** Matrix Product (a.k.a. Matrix Multiplication)

...
The Identity Matrix

Remember the concept of Multiplicative Identity?

**Definition:** **Identity Matrix**

```
[ 1 0 0 ]
[ 0 1 0 ]
[ 0 0 1 ]
```

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Matrix Powers

**Definition:** $n^{th}$ **Matrix Power**

```
[ 1 0 0 ]
[ 0 1 0 ]
[ 0 0 1 ]
```

**Example(s):**
Example: Affine Transformations (1 / 3)

Used to ‘move’ objects in computer graphics.

Background:

Example: Affine Transformations (2 / 3)

Task:
Zero-One Matrices (1 / 3)

Three Operations:

1. ‘Join’:

2. ‘Meet’:

Example(s):
3. ‘Boolean Product’:

Example(s):

Definition: $r^{th}$ Boolean Power