Worksheet: getting comfortable with matrix indexing

All of these problems use " a_{ij} " for the entry in row *i* and column *j* of a matrix *A*. Do these problems with a group, if possible!

- I. Write down the 3 by 3 matrix *A* whose entries are given by
- (a) $a_{ij} = \text{minimum of } i \text{ and } j$
- **(b)** $a_{ij} = (-1)^{i+j}$
- (c) $a_{ij} = i/j$

II. What words would you use to describe each of these classes of matrices? Give **a** 3 by 3 example in each class. Which matrix belongs to all four classes?

(a)
$$a_{ij} = 0$$
 if $i \neq j$

(b)
$$a_{ij} = 0$$
 if $i < j$

(c) $a_{ij} = a_{ji}$

(d) $a_{ij} = a_{1j}$

- **III.** Write a sum in terms of entries a_{ij} and b_{ij} . **Don't** look-up the formula!
- (a) Suppose *A* is $m \times n$ and *B* is $n \times p$. Let C = AB. Write a formula for each entry of *C*:

 $c_{ij} =$

(b) Suppose A is $m \times 1$ and B is $1 \times p$, so A is actually a column vector and B is actually a row vector. Again let C = AB, and write a formula for c_{ij} . (This time it is very simple! You are writing-out how the *outer product* works.)

 $c_{ij} =$

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