

## Matrices in EXCEL

First enter the desired matrices.

	A	B	C	D	E	F	G	H	I	J	K
1											
2		A				B					
3			1	3	5		0	3	-1		
4			-2	4	-6		9	5	2		
5											

To compute  $A + B$ , first select a range of cells with the same dimensions.

B8												
	A	B	C	D	E	F	G	H	I	J		
1												
2		A				B						
3		1	3	5		0	3	-1				
4		-2	4	-6		9	5	2				
5												
6												
7		A+B										
8												
9												
10												

hit = and then select all the cells in A, +, select all the cells in B.

A			B																					
	1	3	5		0	3	-1																	
	-2	4	-6		9	5	2																	
A+B																								
	=B3:D4+F3:H4																							

Press **Ctrl-Shift-Enter** at the same time and the resulting sum matrix  $A+B$ , should appear.

A			B		
1	3	5	0	3	-1
-2	4	-6	9	5	2
A+B					
1	6	4			
7	9	-4			

To multiply  $AB$ , use the MMULT command.

A				B			
	1	3			0	3	
	-2	4			9	5	
AB							
=MMULT(B3:C4,F3:G4)							

Press **Ctrl-Shift-Enter** at the same time to see the result. (**Command + Enter** on a MAC)

## Solving a system in EXCEL

$$2x + y - z = 0$$

$$x - 2y + 3z = 11$$

$$-x + 2y + 2z = -6$$

The coefficient matrix is  $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & -2 & 3 \\ -1 & 2 & 2 \end{bmatrix}$ , the unknown matrix is  $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  and the objective matrix is  $B = \begin{bmatrix} 0 \\ 11 \\ -6 \end{bmatrix}$

The system can be written as the following matrix equation  $AX = B$ . Since matrix multiplication is not commutative you multiply both sides of the equation by  $A^{-1}$  on the left.

$A^{-1}AX = A^{-1}B$ .  $A^{-1}A = I$  (identity matrix) and  $IX = X$  so  $X = A^{-1}B$ .

A	B	C	D	E	F	G
	A				B	
	2	1	-1		0	
	1	-2	3		11	
	-1	2	2		-6	

The EXCEL command MINVERSE will find the inverse of a matrix. Use MMULT and MINVERSE to solve the system.

A				B		X
2	1	-1		0		=MMULT(MINVERSE(B3:D5),F3:F5)
1	-2	3		11		
-1	2	2		-6		

	A			B		X
	2	1	-1	0		2
	1	-2	3	11		-3
	-1	2	2	-6		1