

Notes:

- This first homework is rather short. The next two homeworks will be longer. I don't plan on weighting each homework equally.
- You can copy/paste my **sample code** into Maple. However, if you would prefer to do computations using different software, that is ok. Make sure you turn in *all* of your work (including computer code).
- If you end up doing the entire assignment in Maple, feel free to turn in a Maple worksheet (.mw file) instead of a pdf.
- Don't try to do this stuff in a calculator or by hand. A calculator is a poor choice since I want *exact* answers not decimal approximations.

1. Basic matrix operations.

```
restart;
with(LinearAlgebra):
A := <<1|2|3|4|5>,<6|7|8|9|10>,<11|12|13|14|15>,<16|17|18|19|20>,<21|22|23|24|25>>;
B := <<1,0,1,0,1>|<0,-1,0,-1,0>|<1,1,1,1,1>|<-1,-1,-1,-1,-1>|<5,4,3,2,1>>;
```

This will result in...

$$A := \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \\ 16 & 17 & 18 & 19 & 20 \\ 21 & 22 & 23 & 24 & 25 \end{bmatrix} \quad \text{and} \quad B := \begin{bmatrix} 1 & 0 & 1 & -1 & 5 \\ 0 & -1 & 1 & -1 & 4 \\ 1 & 0 & 1 & -1 & 3 \\ 0 & -1 & 1 & -1 & 2 \\ 1 & 0 & 1 & -1 & 1 \end{bmatrix}$$

Notice that in Maple, matrices are either entered row by row or column by column. The “—” (pipe = shift + \) moves over a column and “,” (comma) moves down a row.

- Compute $(AB)^5 \left((6I_5 - B)^{-2} \right)^T$ where I_5 is the 5×5 identity matrix.
- Compute the reduced row echelon form of B .

2. Consider the follow linear system:

$$\begin{array}{rrrrrrrrcl} & & -3x_2 & + & x_3 & + & x_4 & - & 2x_5 & = & -1 \\ 2x_1 & + & & x_2 & + & 2x_3 & + & x_4 & + & x_5 & = & 0 \\ & x_1 & & & + & 3x_3 & & & + & x_5 & = & 6 \\ & & 4x_2 & + & 2x_3 & - & x_4 & + & 4x_5 & = & -5 \\ -2x_1 & + & x_2 & + & x_3 & - & x_4 & + & 2x_5 & = & 2 \end{array}$$

Here's code for creating a vector $\mathbf{x}$ of variables (I'll include the code to wide memory and load the linear algebra package as well):

```
restart;
with(LinearAlgebra):
X := <x[1],x[2],x[3],x[4],x[5]>;
```

Note that my vector of variables is a capital X not lowercase.

- Define the coefficient matrix A and a constant vector $\mathbf{b}$ corresponding to the above system. Then use the command “**A.X=b;**” to display the system.
- Create an augmented matrix: $[A : \mathbf{b}]$ and solve the system by finding its RREF.
Note: As long as sizes are compatible, Maple can create a new matrix from matrix blocks. For example: “**<A|B>**” slaps B next to A and “**<A,B>**” puts B below A.
- It turns out that A is invertible. Solve this system, $A\mathbf{x} = \mathbf{b}$, again using the inverse of A .