

Engineering Differential Equations
Some Useful MATLAB Matrix Algebra Commands

1. To define a matrix in MATLAB, separate the rows by semicolons and separate the entries in a row by spaces or commas. For example, to define the matrix

$$A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & -2 \\ -5 & -1 & 9 \end{pmatrix}$$

use the MATLAB command

```
A = [1 0 2; 3 1 -2; -5 -1 9]
```

2. To compute the determinant of a square matrix, use the command `det`
`det(A)`
3. To compute the inverse of an invertible square matrix, use the command `inv`
`inv(A)`
4. To solve the system of equations $A\mathbf{x} = \mathbf{b}$, use the command `x = A\b`
For example, to solve the system

$$\begin{pmatrix} 1 & 0 & 2 \\ 3 & 1 & -2 \\ -5 & -1 & 9 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 5 \\ 9 \\ -8 \end{pmatrix}$$

use the commands

```
b = [5; 9; -8]
```

```
x = A\b
```

5. The command `rref(A)` generates the row reduced echelon form of the matrix A . Try
`Ab = [1 0 2 5; 3 1 -2 9; -5 -1 9 -8]`
`rref(Ab)`
6. The command `[X, D] = eig(A)` generates the eigenvalues and eigenvectors of a square matrix A . The eigenvalues are the diagonal entries of D , and the corresponding (normalized) eigenvectors are the corresponding columns of X . Try
`A = [6 -2 -1; -2 6 -1; -1 -1 5]`
`[X, D] = eig(A)`