

Lecture 12 - Linear & Non-linear Equations

* prayer / spiritual thought

* announcements

* Unit of the day :

$$1 \text{ hp} = 550 \frac{\text{ft lbf}}{\text{s}}$$

↑
units of power

I. Linear equations

* Remember, linear equations can be written as :

$$\underline{A} \underline{x} = \underline{b}$$

↑ ↖ ↑
 matrix vectors
 (2D array) (1D array)

A. Matrix operations

- addition, subtraction
- scalar multiplication
- Matrix $\cdot$ array multiplication
- transpose
- determinant
- inverse

* more (extra)

- eigenvalues
- norm

Example 1A
 Matrix Operations

B. Solution to linear equations

- $x \leftarrow \text{np.linalg.solve}(A, b)$
- Better to use than inverse. Uses more advanced methods. This matters when A, b are large.

Example 1B
Linear Equations

II. Non-linear equations

- * Remember we write non-linear equations in a common form, i.e. residual form

$$f(x) = 0$$

A. Single equations

- * 1 equation, 1 unknown

$$f(x) = 0$$

- fixed-point method (extra)
- `f.solve`.

Example 2A
Single Non-Linear Equation

B. Systems of equations

- * N equations, N unknowns
- `f.solve` with arrays
- `f.solve` with parameters (extra)

Example 2B
System of Non-Linear
Equations