ME 3001 Lecture, Roots of Non-Linear Equations

- **What is a Non-Linear Equation ?**

  " an equation whose graph does not form a straight line"

- **Different Types of Non-Linear Equations**

  - **Polynomials (excluding first order)**

  - **Transcendentals**

    " a transcendental function "transcends" algebra in that it cannot be expressed in terms of a finite sequence of the algebraic operations of addition, multiplication, and root extraction. Examples of transcendental functions include the exponential function, the logarithm, and the trigonometric functions. "

    * Exponentials

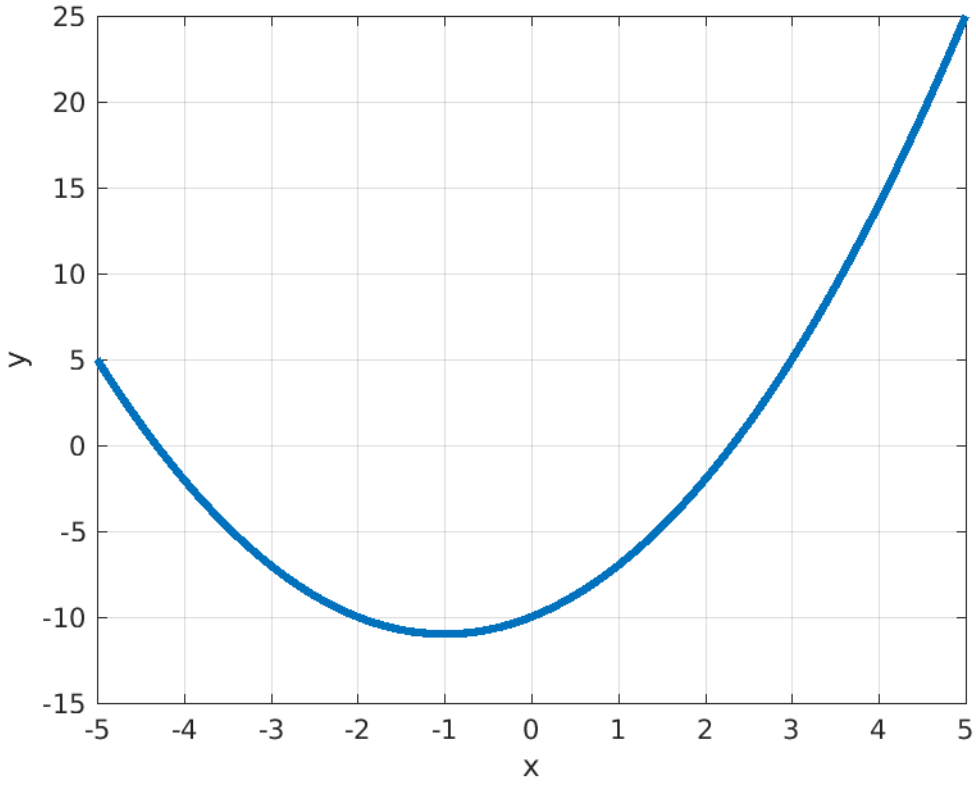
    * Logarithms

    * Trigonometrics

- **What does "Solve the Equation" mean?**

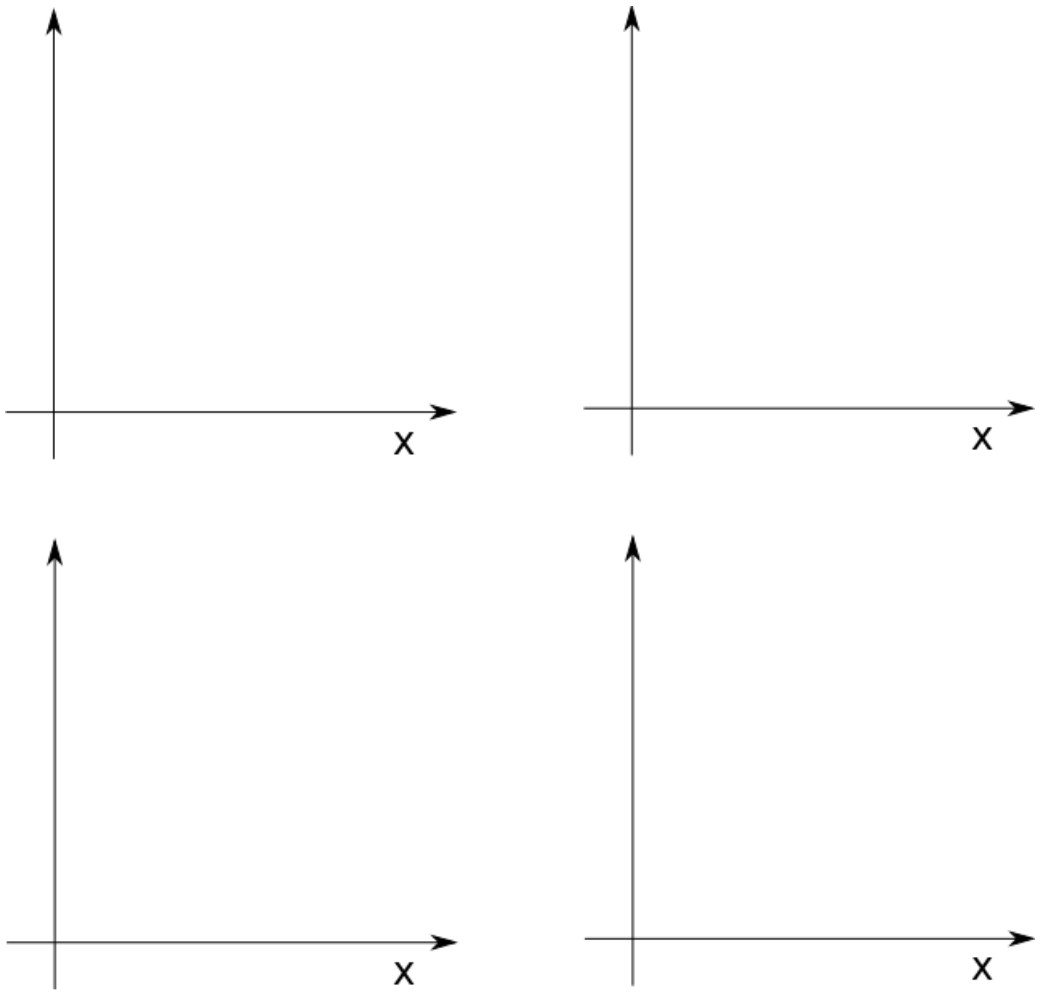
- **Let us do a simple example**

$$y = x^2 + 2x - 10$$



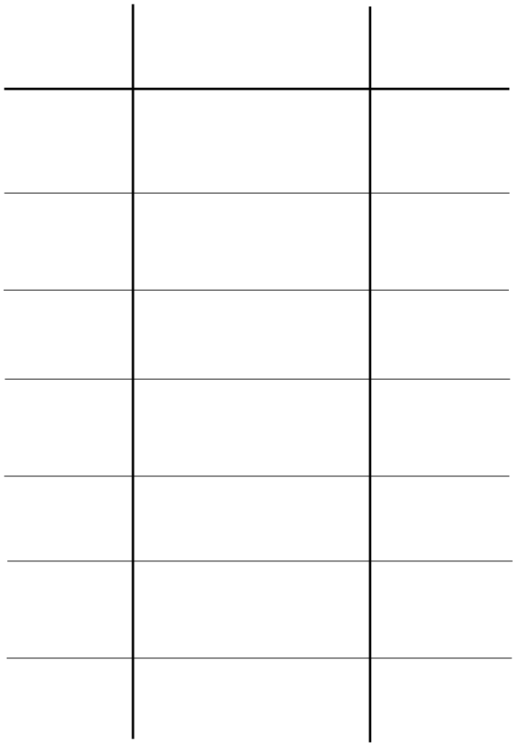
- **It is useful to have generalized methods**
  - A solution technique for the general problem
  - Standard set of steps or *algorithm* for finding the solution

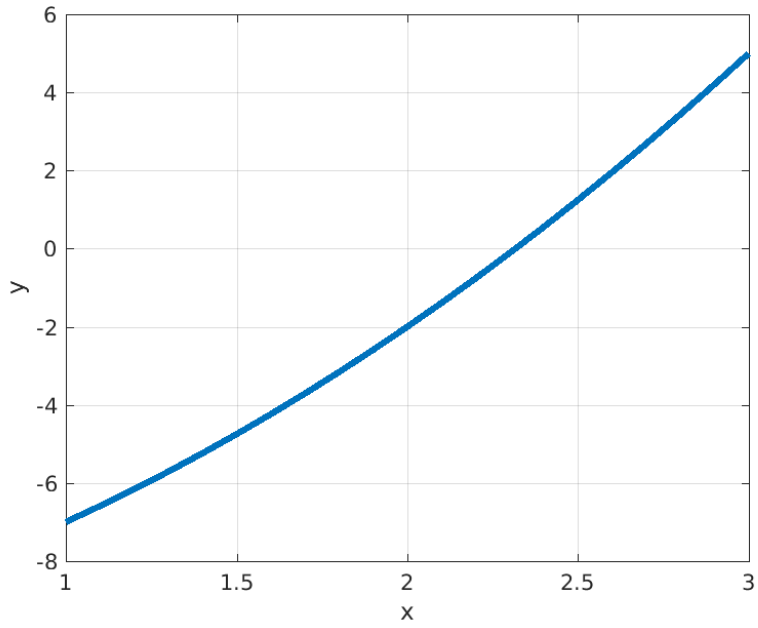
- **The general *root-finding* problem**



- **Method 1 -** *The Incremental Search*
  - We are looking for where the line crosses the x-axis, so how can we tell if this happens?
  - Let us investigate with our simple example.

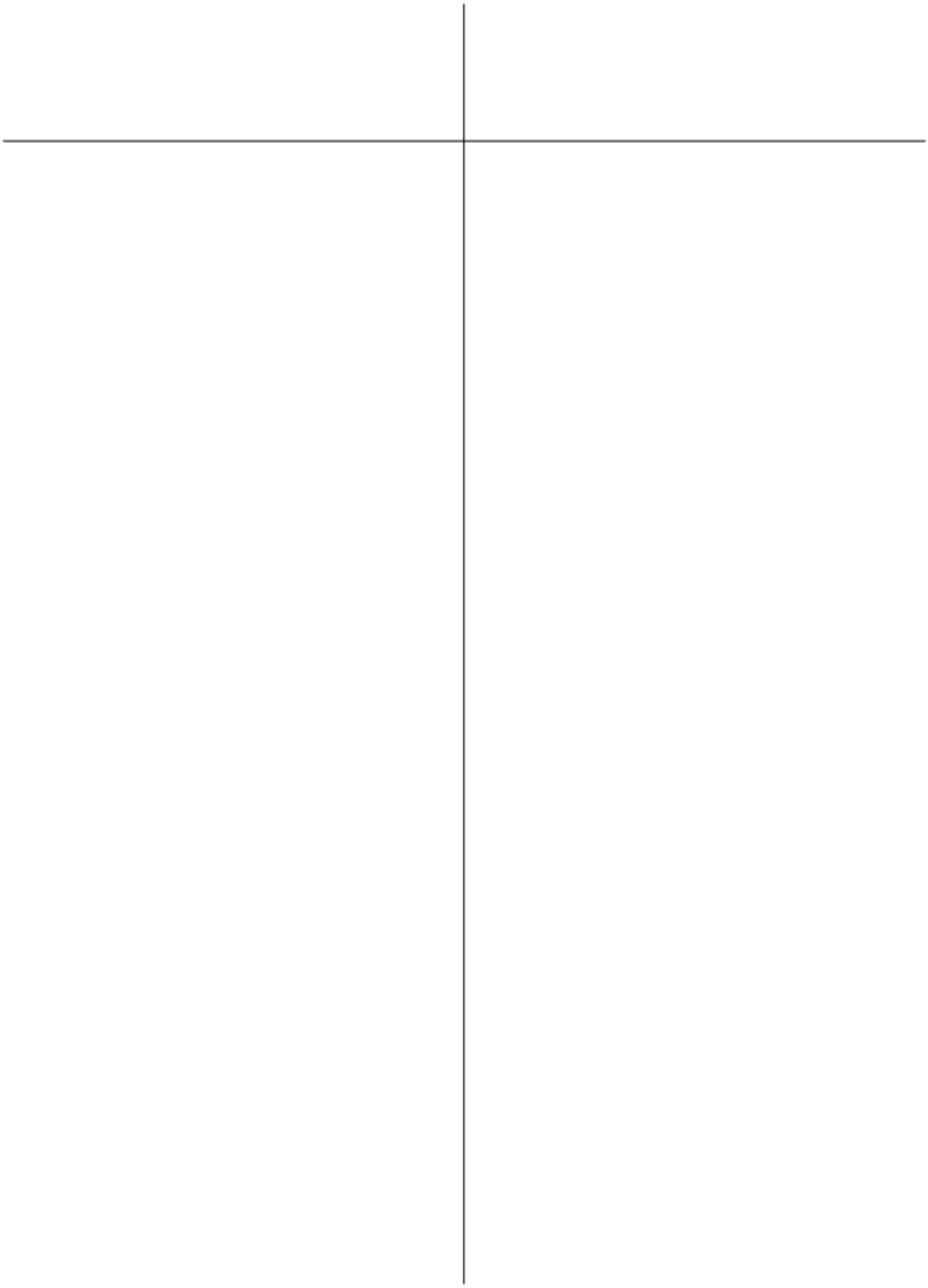
$$y = x^2 + 2x - 10$$





- **Method 2 -** *The Bisection Method*
  - different than the previous method because it is a *bracketing method*
  - It is a faster method in general but can you think of any tradeoffs?

- *Advantages, Disadvantages, and Pitfalls*



- **REMINDER - Homework 1 is posted on ilearn**

  DUE: Friday, Jan. 27

- **REMINDER - Instructions for Installing MATLAB on your computer have been posted on ilearn.**