Functions

Exercise

By:
AMMI Tutors

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1 Exercise:

Bisection Method

Let f be a continuous function and monotone function on the closed interval $[a, b]$ such that $f(a)f(b) < 0$. We are trying to find a solution r pf the equation $f(x) = 0$ in the interval $[a, b]$. Here is how we do it:

We compute $f\left(\frac{a+b}{2}\right)$. Then, exactly, one of the following is true:

- If $f\left(\frac{a+b}{2}\right) = 0$ then we are done. We found a solution $r = \frac{a+b}{2}$.
- Otherwise, if $f(a)f\left(\frac{a+b}{2}\right) < 0$, then we repeat this process and search again for a solution, in the interval $\left[a, \frac{a+b}{2}\right]$
- Otherwise, $f\left(\frac{a+b}{2}\right)f(b) < 0$, we repeat this process and search again for a solution, in the interval $\left[\frac{a+b}{2}, b\right]$.

  We then keep repeating these iterations until either we found a solution, or the length of the interval is less than some predefined bound.

  1. Implement the above bisection method in the function Bisection1 (lower, upper, error).
  2. Check your function by looking for the roots of the function $x^2 - 1$ in the interval $(-\infty, 0]$ and $[0, \infty]$.
  3. Use your previous function to look for the roots of the following function: $e^x - 5x^2$.
     Hint: Kindly study and plot the function e^x and $5x^2$ on the same graph in order to find the interval $[a, b]$ where the roots exists.

2 Exercise

Consider a sphere of radium x.

1. What is the volume of the sphere.
2. Compute the derivative of the volume $w.r.t\ x$.
3. Write that expression as function of the **area** of the sphere.
4. write a function **named myArea** that compute the volume of the sphere and deduce its area.