Assignment 3 Due: 8.4.2022 (7.9.1443 AH)

General Remark:

For all questions, you can verify your results using computer programs. Write all results up to at least 5 significant digits. You must show the formulas used and the calculations.

Question 1:

Find an approximation to $\sqrt[5]{20}$ using Newton's method. Use 2 as an initial guess (x_0). Write the first 4 approximations: x_1 to x_4

Hint: $\sqrt[5]{20}$ is the root of $f(x)=x^5-20$

Question 2:

The function $f(x) = 6(x-3)^4$ has a root at x=3. Can the bisection method be used to find a root of this function with. Justify your answer.

Question 3:

Use Newton-Raphson Method to find the point of intersection (x,y) of the graphs of the two functions $h(x)=e^x$ and $g(x)=x^2$.

Use $x_0=-1$ and compute only x_1, x_2, and x_3.

Question 4:

Use the bisection method to find the root of the equation:

$$\frac{x^4 - x - 10}{x^3 + 7}$$

a- Write the first 4 approximations, using the two ends of the interval [0, 2] (first, verify that both ends have different signs).

b- Find the minimum number of iterations needed to approximate the root such that the absolute error $\leq 10^{-3}$.

Question 5:

Use the fixed-point method (with $x_0=2$) and the secant method (with $x_0=1$ and $x_1=2$) to solve the equation:

$$\mathbf{x - \sin(x) - 0.5 = 0}$$

Use four iterations for each method.