



Mathematics Department

Math 330

1st Exam

2nd Semester 20/21

Student name: ID no.:

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(problems from 1 to 10, 4 points each)

(1) Using the bisection method with $a_0 = 4$, $b_0 = 5$ to estimate the solution of the equation $x^3 - 7x^2 + 15x = 19$, if $c_0 = 4.5$ Find the next 2 iterations c_1, c_2 .

(2) Using the False position method with $a_0 = 4$, $b_0 = 5$ to estimate the solution of the equation $x^3 - 7x^2 + 15x = 19$, If $c_0 = 4.6154$, Find the next iteration c_1 .

3) Using Fixed point theorem, show why the function $g(x) = \sqrt[3]{2x + 5}$ has a fixed point in the interval $[2,3]$

4) Show why the fixed-point iteration generated by the function $g(x) = \sqrt[3]{2x + 5}$ converges in the interval $[2,3]$

(5) The point $p = 2$ is a fixed point of the function $g(x) = \frac{2}{x} + 1$. Show if it is attractive or repulsive and why.

6) The point $p = 3$ is a zero of the function $f(x) = x^3 - 7x^2 + 15x - 9$,
Use Newton iteration to estimate the zero $p = 3$, starting with $p_0 = 3.2$
Find p_1, p_2

7) The point $p = 3$ is a zero of the function $f(x) = x^3 - 7x^2 + 15x - 9$,
using Newton iteration to estimate the zero $p = 3$, Find the order of
convergence R and the asymptotic error constant A .

8) The point $p = 2$ is a fixed point of the function $g(x) = \frac{x}{2} + \frac{2}{x}$

find the order of convergence of the fixed-point iteration generated by $g(x)$

9) If A is $n \times n$ matrix, what is the cost of calculating $3A^3 - 2A$

10) Consider the following system of equations

$$\begin{aligned}x &= g_1(x, y, z) = 3x^2 - 2y^3 + 2z, \\y &= g_2(x, y, z) = 10 - 2xy - z^2 \\z &= g_3(x, y, z) = 10z - 2xy\end{aligned}$$

Use Gauss-Sidel iteration to find the 1st iteration given that the initial point is (3,2,4)

This page each problem worth 5 points

11) Use Newton method to find the 1st iteration of the following system

$$\begin{aligned}x &= 3x^2 - y^3 \\ y &= 2y^2 - 2x\end{aligned}$$

given that the initial estimation is (1.2, 3.4)

12) Solve the following system of equations using Gaussian elimination with partial pivoting and three digits rounding

$$\begin{aligned}6.33x - 0.113y &= 6.10 \\ 10.2x + 0.182y &= 10.6\end{aligned}$$