Root Finding

Final Exam 1999S

1. Use Newton's method to find a root of the following equation. Start at x=2.

$$x^3 - 70 = 0$$

7. Solve the following set of linear equations using Gauss-Seidel

$$\begin{aligned} -x+2y+4z &= 10 \\ x+3y+2z &= 11 \\ 2x+y &= 5 \end{aligned}$$

Hour Exam 2000S

2) Use Newton's Method to find the root for $x^3 - 2x^2 + 4x = 41$
Make your initial guess x=1. Perform at least one iteration.

3) Solve by the Gauss-Seidel Method. Perform at least one complete iteration.

$$\begin{aligned} 2y + 3z &= -1 \\ 2x + y &= 12 \\ -x + 5y + 2z &= -6 \end{aligned}$$

4) Use Secant Method to find the root for $\ln(x) + x^3 = 400$.
Use initial guesses of $x_1=1$ and $x_2=2$. Show one iteration and identify x_3.

5) Solve the following set of linear equations using Gauss-Jordan elimination. You need only show enough work to establish the method. Be clear enough that a college freshman could finish your work from your description.

$$\begin{aligned} x + 3y + 2z &= 11 \\ 2x + y &= 6 \\ -x + 2y + 5z &= 9 \end{aligned}$$

6) Solve for one root by one-point iteration. Show enough iterations to determine if the solution is converging or diverging. Start at x = 2.

$$x^3 - \ln(x) = 50$$

Final Exam 2001F

2. Find a root of the following equation by any **two** numerical methods of your choice. To receive full credit you must layout the mathematical method clearly.

$$x^3 - 2\ln(x) = 34$$

8. Show how to solve the following set of linear equations using the Gauss-Seidel method

$$\begin{aligned} -x^2 + 2y + 5z^3 &= 18 \\ 2x + y^2 &= 6 \\ 7x^3 + 3y + 5z &= 14 \end{aligned}$$

Final Exam 2002F

5. Layout the solution to the following set of equations using the Gauss-Seidel Method:

$$2x + y^2 - z^2 = -3$$
$$3x^3 + 2y - 4z = -1$$
$$x^2 - 7y^2 - z = -30$$

Final Exam 2005S

8. Layout the solution to the following set of equations using the Gauss-Seidel Method:

$$2x + y - 5z = -3$$
$$3x + 3y - 4z = -1$$
$$9x - 2y - z = -30$$

Final Exam 2005F

1. Layout the solution to the following set of equations using the Gauss-Seidel Method:

$$2x + y - 5z = -3$$
$$3x + 3y - 4z = -1$$
$$9x - 2y - z = -30$$

Solution:

Make a dominant Diagonal:

$$9x - 2y - z = -30$$
$$3x + 3y - 4z = -1$$
$$2x + y - 5z = -3$$

Solve for each variable in turn:

$$x = (-30 + 2y + z)/9$$
$$y = (-1 - 3x + 4z)/3$$
$$z = (-3 - 2x - y)/(-5)$$

N	x	y	z
	0	1	1
1	-3.00000	4.00000	0.20000
2	-2.42222	2.35556	0.10222
3	-2.79852	2.60148	0.00089
4	-2.75513	2.42298	-0.01746
5	-2.79683	2.44023	-0.03069
6	-2.79447	2.42022	-0.03374
7	-2.79926	2.42093	-0.03552
8	-2.79930	2.41861	-0.03600
9	-2.79986	2.41854	-0.03624
10	-2.79991	2.41826	-0.03631
11	-2.79998	2.41823	-0.03635

Hour Exam #2 2005F

4 Setup the one-point iteration to find the root to the following equations starting with x = 1.

$$x^{2.6} - 2\ln(x) - x = 15$$

Solution:

$X_{N+1} = [15+X_N + 2*\ln(X_N)]^{(1/2.6)} = g(X)$. Start with $X_1 = 1$

N	X_N	g(x)
1	1	2.9048
2	2.90485	3.1675
3	3.16745	3.1938
4	3.19377	3.1963
5	3.19634	3.1966
6	3.19659	3.1966

Final Exam 2005F

4. Show how to find a root of the following equation by any **two** numerical methods of your choice. To receive full credit you must give the method's name and layout the mathematical method clearly.

$$x^3 - 2\ln(5+x) = 34$$

9. Show how to solve the following set of linear equations using the Gauss-Seidel method

$$\begin{aligned} -x + 2y + 5z &= 44 \\ 2x + 4y - 2z &= 32 \\ 7x + y + 2z &= 27 \end{aligned}$$