

## Unit 7 - Week 5

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## Assignment 5

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2020-10-21, 23:59 IST.**

1) Consider the following equations

$$\begin{aligned} 10x_1 - x_2 + 2x_3 &= 6 \\ -x_1 + 11x_2 - x_3 + 3x_4 &= 25 \\ 2x_1 - x_2 + 10x_3 - x_4 &= -11 \\ 3x_2 - x_3 + 8x_4 &= 15. \end{aligned}$$

Using  $(x_1 \ x_2 \ x_3 \ x_4) = (0 \ 0 \ 0 \ 0)$  as the initial guess, the value of  $x_1$  after three iterations of Gauss-Jacobi method is ?

- 0.9326  
 1.0152  
 0.6000  
 None of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
0.9326

1 point

2) Solve the following equation by Gauss Seidel method up to three iterations and find the value of  $x$  (Choose  $(x, y, z) = (0, 0, 0)$  as the initial guess).

$$\begin{aligned} 4x - 3y - z &= 40 \\ x - 6y + 2z &= -28 \\ x - 2y + 12z &= -86. \end{aligned}$$

- 12.11  
 13.28  
 11.51  
 9.86

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
11.51

1 point

3) Iteration is also called as

- Accurate process  
 Self-correcting process  
 Approximating process  
 Rounding off process

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Self-correcting process

1 point

4) To ensure that the following system of equations

$$\begin{aligned} 2x_1 + 7x_2 - 11x_3 &= 6 \\ x_1 + 3x_2 + x_3 &= -5 \\ 7x_1 + 5x_2 + x_3 &= 17 \end{aligned}$$

converges using the Gauss Siedel method, one can rewrite the above equations as follows

- $\begin{pmatrix} 2 & 7 & -11 \\ 1 & 3 & 1 \\ 7 & 5 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 6 \\ -5 \\ 17 \end{pmatrix}$   
  $\begin{pmatrix} 7 & 5 & 1 \\ 1 & 3 & 1 \\ 2 & 7 & -11 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 17 \\ -5 \\ 6 \end{pmatrix}$   
  $\begin{pmatrix} 7 & 5 & 1 \\ 1 & 3 & 1 \\ 2 & 7 & -11 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 6 \\ -5 \\ 17 \end{pmatrix}$   
 The equations can not be rewritten in a form to ensure convergence

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\begin{pmatrix} 7 & 5 & 1 \\ 1 & 3 & 1 \\ 2 & 7 & -11 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 17 \\ -5 \\ 6 \end{pmatrix}$

1 point

5) Which of the following systems of linear equations has a strictly diagonally dominant coefficient matrix ?

- $4x_1 + x_2 - x_3 = 5$   
  $-x_1 + 3x_2 + x_3 = -4$   
  $2x_1 + 2x_2 + 5x_3 = 1$   
  $4x_1 = 2x_2 - x_3 - 1$   
  $x_1 + x_3 = -4$   
  $3x_1 - 5x_2 + x_3 = 3$   
  $-2x_1 + x_2 + \frac{1}{2}x_3 = 4$   
  $x_1 - 2x_2 - \frac{1}{3}x_3 = -4$   
  $x_2 + 2x_3 = 0$   
 None of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $4x_1 + x_2 - x_3 = 5$

$-x_1 + 3x_2 + x_3 = -4$   
 $2x_1 + 2x_2 + 5x_3 = 1$   
 $-2x_1 + x_2 + \frac{1}{2}x_3 = 4$   
 $x_1 - 2x_2 - \frac{1}{3}x_3 = -4$   
 $x_2 + 2x_3 = 0$

1 point

6) If  $\begin{pmatrix} -4.5 \\ -4 \\ 1 \end{pmatrix}$  is an eigenvector of  $\begin{pmatrix} 8 & -4 & 2 \\ 4 & 0 & 2 \\ 0 & -2 & -4 \end{pmatrix}$ , the eigenvalue corresponding to the eigenvector is

- 1  
 4  
 -4.5  
 6

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
4

1 point

7) What is a dominant eigenvector of the matrix

$$\begin{pmatrix} 1 & 2 & 0 \\ -2 & 1 & 2 \\ 1 & 3 & 1 \end{pmatrix},$$

using the power method with scaling after seven iteration ? Use  $X_0 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$  as the initial approximation.

- $\begin{pmatrix} 0.50 \\ 0.50 \\ 1.00 \end{pmatrix}$   
  $\begin{pmatrix} 0.75 \\ 0.48 \\ 1.00 \end{pmatrix}$   
  $\begin{pmatrix} 0.65 \\ 0.55 \\ 1.00 \end{pmatrix}$   
 None of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\begin{pmatrix} 0.50 \\ 0.50 \\ 1.00 \end{pmatrix}$

1 point

8) For the given matrix  $A$ ,

$$A = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ -1 & 1 & 2 \end{pmatrix}$$

What is the spectral radius of  $A^t A$ ?

- 2  
 7  
  $7 + \sqrt{7}$   
 None of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $7 + \sqrt{7}$

1 point

9) Which of the following are true about symmetric matrix ?

- A symmetric matrix should be square matrix  
 The eigenvalue of the real symmetric matrix should be real number  
 If the matrix is invertible, then the inverse matrix is symmetric matrix  
 All of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
All of these

1 point

10) For the given matrix

$$A = \begin{pmatrix} 2 & -1 & 1 \\ 2 & 2 & 2 \\ -1 & -1 & 2 \end{pmatrix}.$$

What is the spectral radius of  $T = D^{-1}(L+U)$ , where  $D$  be the diagonal matrix whose diagonal entries are those of  $A$ ,  $-L$  be the strictly lower triangular part of  $A$ , and  $-U$  be the strictly upper triangular part of  $A$  ?

- 2  
 1.5  
  $\frac{\sqrt{5}}{2}$   
 None of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\frac{\sqrt{5}}{2}$

1 point