

## 2212 Assignment

1. Find the angle between the vector  $\mathbf{I} - 2\mathbf{j} + 3\mathbf{k}$  and  $3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$
2. If  $\mathbf{a} = 5\mathbf{j} - \mathbf{j} - 3\mathbf{k}$  and  $\mathbf{b} = \mathbf{i} + 3\mathbf{j} - 5\mathbf{k}$  then show that the vector  $\mathbf{a} + \mathbf{b}$  and  $\mathbf{a} - \mathbf{b}$  are perpendicular.
3. Find the value of  $x$  and  $y$  if they are equal matrices.

$$\begin{pmatrix} x-2 & 3 \\ -2 & 3y \end{pmatrix} = \begin{pmatrix} 1 & 3 \\ -2 & 15 \end{pmatrix}$$

4. The projection of a vector  $\mathbf{b}$  onto the line through  $\mathbf{a}$  is the closest point  $p = \mathbf{a} \left( \frac{\mathbf{a}^T \mathbf{b}}{\mathbf{a}^T \mathbf{a}} \right)$ .

$$\mathbf{a} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \mathbf{b} = \begin{bmatrix} 4 \\ 7 \end{bmatrix}$$

5. Find  $\mathbf{A}^{-1}$  by Gauss-Jordan elimination starting form  $\mathbf{A} = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$
6. Write the complete solution as  $x_p$  plus any multiple of  $\mathbf{s}$  in the nullspace:

$$x + 3y + 3z = 1$$

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

7. For the system  $x + y = 4$  and  $x - y = 2$ , Cramer's rule givens  $x = ?$
8. Find eigenvalues for matrix  $\mathbf{A}$

$$\mathbf{A} = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

9. Find Eigenvectors

$$\mathbf{A} = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$$

10. Factor these two matrices into  $\mathbf{A} = \mathbf{X} \Lambda \mathbf{X}^{-1}$

$$\mathbf{A} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$$