

STT 461**In-Class Assignment 7**

For the problems below, use the following matrices:

$$A = \begin{bmatrix} 5 & -1 & 5 \\ -1 & 10 & 1 \\ 5 & 1 & -3 \end{bmatrix}$$

$$B = \begin{bmatrix} 5 & 3 & -2 \\ 1 & 1 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix}$$

$$x = \begin{bmatrix} 5 \\ 1 \\ 4 \end{bmatrix}$$

1. Define these matrices in R (using whichever technique you prefer).
2. Compute CB.
3. Compute Ax.
4. Find $\det(C)$
5. Calculate $B^T B$ and BB^T . What kind of matrices are these results?
6. Compute $x^T x$. Note that this is the square of the norm of x.
7. Solve the following for the unknown y: $Ay = x$.
8. Find the eigenvalues and eigenvectors of A. Note that the eigenvectors are perpendicular (this can be checked by seeing that the inner product is zero).
9. Find the eigenvalues and eigenvectors of A^2 . How do the eigenvalues compare to that of A?
10. Take a vector z = (1, -3, 4). Re-write z using the eigenvectors of A as the new basis.