Linear Algebra
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1. Let F: R3 to R3 be a linear operator defined by

$$F(x,y,z) = (2x-2y, 3y, 3z)$$

1) Find the eigenvalues and eigenvectors of the linear operator matrix
2) For each eigenvalue find the rank of the matrix lambda I - A
3) Compute A^10 and A^(–10)

2. Find all values of a, b, c for which A is symmetric

$$A = \begin{matrix} 2 & a-2b+2c & 2a+b+c \\ 3 & 5 & a+c \\ 0 & -2 & 7 \end{matrix}$$

3. Use Gram-Schmidt process to transform the basis

u1 = (1, 0, 0), u2 = (3, 7, –2), u3 = (0, 4, 1)

into orthonormal basis

4. Consider these sets of vectors in R3

A = { (3, 6, 1), (–1, –2, 7), (2, 4, 8) }
B = { (2, 1, 1), (4, 2, 3), (1, 3, 0) }
C = { (15, 0, –1), (1, 7, 4) }
D = { (1, 3, 3), (0, 1, 4), (5, 6, 3), (7, 2, –1) }
E = { (3, –1, 2), (6, –2, 4), (1, 5, 3), (2, 10, 6) }

1) Which sets are linearly independent ?
2) Which sets span R3 ?
3) Which sets form a basis for R3 ?