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**MATH221 07 problems**

Name, ID

**Homework due May 25th**

1. Let  $\{v_1, v_2, \dots, v_n\}$  be an orthonormal basis for  $n$ -dimensional vector space  $V = \{v_1, v_2, \dots, v_n\} \in \mathbb{R}^n$ , then explain the orthogonal complement of  $W = \text{span}\{iv_i - jv_j \mid 1 \leq i < j \leq n\}$  is  $W^\perp = \{tv \mid t \in \mathbb{R}\}$   
(Hint) Use the following equation.

$$ie_i - je_j = \sum_{k=i}^{j-1} (ke_k - (k+1)e_{k+1}), \quad \text{for } 1 \leq i, j \leq n, j \geq i+2.$$

2. Let  $A$  be given by

$$A = \begin{pmatrix} 2 & 1 & 3 \\ 4 & -6 & -2 \\ -2 & 7 & 5 \end{pmatrix}$$

- (1) Find an orthonormal basis for the column space of  $A$ .
- (2) Let the vector  $b$  be given by  $b^T = (1, 1, 0)$ , then find the orthogonal projection of the vector  $b$  onto column space  $A$ .