

Quiz 5

**Instructions:** This quiz is worth 35 points and the value of each question is listed with each question. You may use any notes or books but you must work individually. The only computation aid which you may use is MATLAB, unless otherwise indicated. Make sure to write clearly and justify your answers.

(1.)(5 pts.) Let  $S$  be the subspace of  $\mathbb{R}^4$  with  $S = \text{Span}[(1, 0, -2, 1)^T, (0, 1, 3, -2)^T]$ . Find a basis for  $S^\perp$ .

(2.)(10 pts.) Suppose that  $A = \begin{pmatrix} 1 & 2 & 2 \\ 1 & 1 & 2 \\ 3 & 1 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} -4 & 1 & 1 \\ -3 & 3 & 2 \\ 1 & -2 & -2 \end{pmatrix}$ . Find

- (a.)  $\langle A, B \rangle$
- (b.)  $\|A\|$
- (c.)  $\|B\|$
- (d.) The angle between  $A$  and  $B$
- (e.) The orthogonal projection of  $A$  onto the space spanned by  $B$ .

(3.)(10 pts.) Let  $\langle f(x), g(x) \rangle$  be the usual inner product on  $C[0, 1]$ . If  $f(x) = 5x^2 - 3$  and  $g(x) = -6x - 5$ , find:

- (a.)  $\langle f(x), g(x) \rangle$
- (b.)  $\|f(x)\|$
- (c.)  $\|g(x)\|$
- (d.) The angle between  $f(x)$  and  $g(x)$
- (e.) The orthogonal projection of  $f(x)$  onto the space spanned by  $g(x)$ .

(4.)(10 pts.) Let  $A = \begin{pmatrix} 3 & 6 & 3 & 3 & 6 & 1 \\ 5 & 10 & 4 & 2 & -3 & 6 \\ 7 & 14 & 2 & 0 & -11 & 7 \\ 1 & 2 & 0 & 0 & -1 & 2 \end{pmatrix}$  and find:

- (a.) A basis for  $\text{Col}(A^T)$
- (b.) A basis for  $\text{Col}(A^T)^\perp$ .

**Extra Credit**(10 pts.) Write down a MATLAB command for each part of problem (2.) which will find the answer for that part.