AMSC/CMSC 660   Quiz 3   ,   Fall 2003

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, communication with others, scratchpaper, etc.

Name _____

Student number _____

1. (10) Suppose we have a matrix A of dimension $n \times n$ of rank $n - 1$. Give two numerically stable ways to find a vector z so that $Az = 0$.

2. (10) Recall the Gram-Schmidt algorithm:

   Set $r_{11} = \|a_1\|$.

Set $q_1 = a_1/r_{11}$.

for $k = 1, \ldots n - 1$,

      Set $q_{k+1} = a_{k+1}$.

      for $i = 1, \ldots, k$,

$$r_{i,k+1} = q_{k+1}^T q_i$$
$$q_{k+1} = q_{k+1} - r_{i,k+1} q_i$$

      end for

      $r_{k+1,k+1} = \|q_{k+1}\|$

      $q_{k+1} = q_{k+1}/r_{k+1,k+1}$

end for

    Show that $q_i^T q_k = 0$ for $i < k$.