GEORGIA TECH                                                        SCHOOL OF MATHEMATICS
                                                                                    MATH 1502

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CALCULUS II
**Quiz # 12**
*November 28th 2007*

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**First Name :** _____

**Last Name :** _____

**Section & TA's name :** _____

1. Let $A = \begin{bmatrix} 1 & 2 & 4 & 1 \\ 0 & 2 & 2 & 0 \\ 2 & 3 & 7 & 1 \\ 1 & 1 & 3 & 0 \end{bmatrix}$

   (*Use the back page for your computations*)

   (a) Find a basis for $\mathrm{Im}(A)$

   Basis for $\mathrm{Im}(A)$ :

   _____-

   (*Use this space below for computations*)

*Use this page for your computations*

(b) Construct an orthonormal basis for $\text{Im}(A)$ :
   (*Hint : (i) use the Gram-Schmidt method*
   *(ii) order the vectors in the previous basis from the simplest to the*
   *most complicated.*)

Orthonormal basis :

_____-

(*Use this space below for computations*)

*Use this page for your computations*

(c) Find the orthogonal projection $P$ onto $\text{Im}(A)$

$$P \;=\;$$

_____-

$\big($*Use this space below for computations*$\big)$

*Use this page for your computations*

2. Let $A$ be a $4 \times 4$ matrix such that $A^t\mathbf{x} = 0$ only when $\mathbf{x}$ is a multiple

of $\begin{bmatrix} 1 \\ -2 \\ 1 \\ 0 \end{bmatrix}$. Let $\mathbf{b} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$.

(a) Does the equation $A\mathbf{x} = \mathbf{b}$ have a solution ? (Justify your answer)

*YES* $\square$                                              *NO* $\square$

Justification :

(b) Is the solution unique ?(Justify your answer)

$YES$ □                              $NO$ □

Justification :