

**Math 224**  
**Quiz 4**  
**Thursday, October 18, 2007**

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**Note:** You are allowed to use Maple for computation on this quiz.

1. Find the volume of the 4-box in  $\mathbf{R}^5$  determined by the vectors

$$[1, 1, 1, 0, 1], [0, 1, 1, 0, 0], [3, 0, 1, 0, 0], [1, -1, 0, 0, 1].$$

2. Determine whether the points  $(2, 0, 1, 3)$ ,  $(3, 1, 0, 1)$ ,  $(-1, 2, 0, 4)$ , and  $(3, 1, 2, 4)$  lie in a plane in  $\mathbf{R}^4$ .

3. Let  $T : \mathbf{R}^3 \rightarrow \mathbf{R}^3$  be defined by  $T([x, y, z]) = [x - 2y, 3x + z, 4x + 3y]$ . Find the volume of the image under  $T$  of the box  $0 \leq x \leq 2$ ,  $-1 \leq y \leq 3$ ,  $2 \leq z \leq 5$  in  $\mathbf{R}^3$ .

4. Let  $T : \mathbf{R}^n \rightarrow \mathbf{R}^n$  be a linear transformation of rank  $n$  with standard matrix representation  $A$ . Let  $G$  be an  $n$ -box in  $\mathbf{R}^n$  of volume  $V$ . Find an expression for the volume of the image of  $G$  under  $T \circ T$ .