Quiz 5, Math. 415, **Thursday, July 2nd, 2009**

Explain your answers carefully. Write complete sentences, not just formulas.

1 (15 points) Let $a_1 = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$, $a_2 = \begin{pmatrix} 2 \\ 4 \\ 7 \end{pmatrix}$, $a_3 = \begin{pmatrix} 3 \\ 6 \\ 10 \end{pmatrix}$. Is $\{a_1, a_2, a_3\}$ a basis for $\mathbb{R}^3$? Explain!

2 (15 points) Let $f_1 = 1 + x, f_2 = 1 - x^2$. Is $\{f_1, f_2\}$ a basis for P^2, the vector space of all polynomials of degree 2 or less. Explain!

3 (15 points) Find a basis for the vector space $\mathtt{Mat}_{3\times 2}$ of 3×2 matrices. What is the dimension?

4 (15 points) Find a basis for the plane in $\mathbb{R}^3$ with equation $2x + 2y - z = 0$.

5 Let $\begin{pmatrix} 1 & 3 & 4 \\ 3 & 9 & 12 \end{pmatrix}$.

a. (8 points) Find the null space $N(A)$.

b. (7 points) Find the column space $C(A)$.

c. (8 points) Find the left null space $N(A^t)$.

d. (7 points) Find the row space $C(A^t)$.