Math 250 **Name (Print):** _____

Fall 2013

Quiz 6

1. (10 pts) Determine the value(s) of c for which the given matrix is not invertible.

$$\begin{bmatrix} 1 & 2 & -1 \\ 2 & 3 & c \\ 0 & c & -15 \end{bmatrix}$$

Ans: (Expanding along column 1) The determinant is:

$$1(3(-15) - c^2) - 2(2(-15) + c) = -c^2 - 2c + 15.$$

We require the determinant equals to 0, i.e. $-c^2 - 2c + 15 = 0$, and by factoring

$$(c + 5)(3 - c) = 0.$$

So $c = -5, 3$.

2. (10 pts) Find the standard matrix associated with the linear transformation T and use it to determine whether T is **onto**.

$T : \mathbb{R}^2 \to \mathbb{R}^3$ defined by

$$T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}\right) = \begin{bmatrix} 3x_2 \\ 2x_1 - x_2 \\ x_1 + x_2 \end{bmatrix}$$

Ans: The standard matrix is

$$A = \begin{bmatrix} 0 & 3 \\ 2 & -1 \\ 1 & 1 \end{bmatrix}.$$

T is onto iff A has rank 3. However, it is clear that $rank(A) \leq 2$. Therefore, T is **not** onto.