Midterm Exam 2

Spring 2012	Math 0280	
100 points total	Your name:	
No calculators. Sh	now all your work (no work $=$ no	o credit). Write neatly.

1. (15 points) Prove that every line through the origin in \mathbb{R}^2 is a subspace of \mathbb{R}^2 .

2. (15 points) Prove that T is a linear transformation if

$$T \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -y \\ x + 2y \\ 3x - 4y \end{bmatrix}.$$

You can apply any method.

3. (20 points) By calculating $\det(A-\lambda I)$ find all the eigenvalues of the matrix

$$A = \left[\begin{array}{cc} 2 & 2 \\ 2 & -1 \end{array} \right]$$

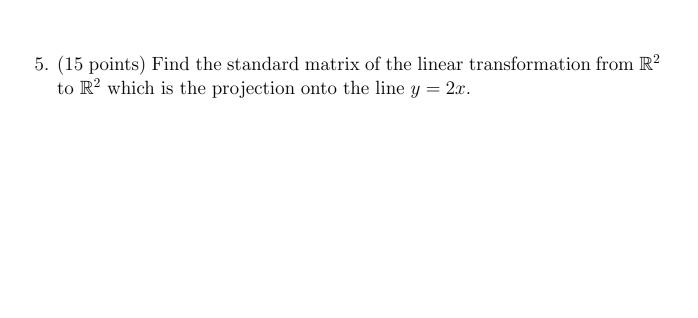
and an eigenvector that corresponds to the larger eigenvalue.

4. For the matrix

$$A = \left[\begin{array}{ccc} 1 & 0 & -1 \\ 1 & 1 & 1 \end{array} \right]$$

(a) (10 points) find a basis for $\operatorname{col}(A)$

(b) (10 points) find a basis for null(A)



6. (15 points) Find a basis for the span of the given vectors from among the vectors themselves

$$\left[\begin{array}{c} 0\\1\\-1\end{array}\right], \quad \left[\begin{array}{c} 1\\-1\\0\end{array}\right], \quad \left[\begin{array}{c} -1\\0\\1\end{array}\right]$$

bonus problem (10 points extra) Find the standard matrix of the linear transformation from \mathbb{R}^2 to \mathbb{R}^2 which is the reflection in the line y=mx.