Name: ______________________________________

MAS 4105 Test 3 Spring 2014

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1. (12 points) Let $T: P_1(R) \to P_1(R)$ be the linear transformation $T(a+bx) = (b-a) - bx$. Let $\beta = \{1, x\}$ and $\gamma = \{1+x, 1-x\}$ be ordered bases.

   (a) Calculate $[T]_\beta^\beta$.

   (b) Calculate $Q = [I]_\gamma^\beta$.

   (c) Calculate $[T]_\gamma^\gamma$.

   (d) Calculate T^{-1}. That is, find $T^{-1}(a+bx)$.

2. (10 points) Let V and W be vector spaces, and let $T: V \to W$ an invertible linear transformation. Prove that the inverse of T is linear.

3. (9 points) Let A be an invertible matrix. Prove that A^t is invertible.

4. (9 points) A square matrix Q is called **orthogonal** if $QQ^t = I$. Prove that if Q is orthogonal, then $\det(Q) = \pm 1$.