MATH 201: Linear Algebra – Quiz 4

NAME: _____ ID Number: _____

Problem 1. Let P denote the set of polynomials of any degree. Consider the function $T : P \to P$ defined by

$$T(p(x)) = p'(x).$$

Is T an isomorphism? That is, is T an invertible, linear map?

Problem 2. Give two different bases $\mathcal{B}$ and $\mathcal{B}'$ for the linear space $\mathbb{R}^{2\times 2}$. Write a matrix A such that

$$A[x]_{\mathcal{B}} = [x]_{\mathcal{B}'}.$$

Problem 3. Let $\vec{u} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$.

(a) Compute the **orthogonal projection** of $\vec{v}$ onto the line spanned by $\vec{u}$.

(b) Compute the component of $\vec{v}$ orthogonal to span u.