Homework
MATH 131

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November 7, 2006

1. Find the coordinate vector of $[1, 3, 2]$ in terms of the basis $b_1 = [1, 0, 1], b_2 = [1, 1, 0]$, $b_3 = [0, 1, 1]$.

2. Find the coordinate vector of $2x^2 - 5x + 4$ in terms of the basis $1, x, x^2$.

3. Find the coordinate vector of $2x^3 - 4x - 7$ in terms of the basis $(x-1)^3, (x-1)^2, x-1, 1$

4. Find the polynomial whose coordinate vector is $[2, -1, 3]$ relative to the basis $x^2 - x, x - 1, x^2 + 4$.

November 9, 2006

5. Determine whether $T : F \to \mathbb{R}$ defined by $T(f) = f(0) + f'(0)$ is a linear transformation.

6. Determine whether $T : P \to P$ defined by $T(p(x)) = (x + 1)p(x) - x$ is a linear transformation.

7. Let $L : \mathbb{R} \to \mathbb{R}$ be a linear transformation with $L(1) = a$. Show that $L(x) = ax$ for all $x \in \mathbb{R}$.

8. Determine the kernel and range of the linear transformation $L : P_3 \to P_3$ defined by $L(p(x)) = xp'(x)$.

9. Show a linear transformation $T : V \to W$ is one to one if and only if $T(0_V) = 0_W$.