Math 231 — Hw 18

Sara Jamshidi, Mar 31, 2025

1. In class, we discussed the differential operator, D, over the space P_3, the space of polynomials up to degree 3. The differential operator takes polynomials to their derivatives. Solve the following equation: $D(ax^3 + bx^2 + cx + d) =$

2. If $ax^3 + bx^2 + cx + d$ is represented as the column vector

$$\begin{pmatrix} a \\ b \\ c \\ d \end{pmatrix},$$

   write out $M(D)$. (Hint: Use your previous answer.)

3. In class, we stated that the null D is the space of constant functions. What is the representation of this null space? In other words, what is null $M(D)$?

4. Suppose S is a map that represents a shift in vectors over $\mathbb{R}^3$. $S(a, b, c) = (b, c, 0)$. Describe its null space and give a representation $M(S)$.

5. Now suppose we define a function P that represents a permutation over the vector space $\mathbb{R}^3$. $P(a, b, c) = (b, c, a)$. Describe its null space and give a representation $M(P)$.