Matrix Theory (EE5609) Assignment 23

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***Abstract*—This document solves problem on ideals.**

All the codes for the figure in this document can be found at

https://github.com/Arko98/EE5609/blob/master/Assignment_23

1 Problem

Let $\mathbb{Q}$ be the field of rational numbers. Determine if the following subset of $\mathbb{Q}[x]$ is ideal or not. The subset is defined by all f with degree ≥ 5

2 Solution

Example	The defined subset of $\mathbb{Q}[x]$ be $\mathbb{U}$, $f(x) = c_1x^5 + c_2x^4 \in \mathbb{U}$ $g(x) = -c_1x^5 + c_3x^4 \in \mathbb{U}$
Proof	If $\mathbb{U}$ is an ideal then, $\mathbb{U}$ must be a subset. $\mathbb{U}$ must be closed under addition. $f \in \mathbb{U}$ $g \in \mathbb{U}$ $\implies f + g \in \mathbb{U}$ But here, $f + g = c_1x^5 + c_2x^4 - c_1x^5 + c_3x^4$ $\implies f + g = (c_2 + c_3)x^4 \notin \mathbb{U}$
Observation	$f \in \mathbb{U}$ $g \in \mathbb{U}$ But, $f + g \notin \mathbb{U}$
Conclusion	$\mathbb{U}$ is not closed under addition $\implies \mathbb{U}$ is not a subset of $\mathbb{Q}[x]$ $\implies \mathbb{U}$ is not an ideal of $\mathbb{Q}[x]$