**Homework 4**
**Linear Algebra**
**Math 524**
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**Section 4 Problem 2:** Suppose m is a positive integer. Is the set

$$\{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = m\}$$

a subspace of $P(\mathbb{F})$?

**Solution: 4.2** Let m be a positive integer

$$\begin{aligned}
&\text{Let } x^m + x^{-1} \in \{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = m\} \\
&\text{Let } -x^m \in \{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = m\} \\
&x^m + x^{-1} + -x^m = x^{-1} \notin \{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = m\}
\end{aligned}$$

Thus $\{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = m\}$ is not closed Under Addition so not a subspace

**Section 4 Problem 3:** Is the set

$$\{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = 2n \quad \forall n \in \mathbb{Z}\}$$

a subspace of $P(\mathbb{F})$?

**Solution: 4.2** Let n be any integer

$$\begin{aligned}
&\text{Let } x^{2n} + x^{-1} \in \{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = 2n \quad \forall n \in \mathbb{Z}\} \\
&\text{Let } -x^{2n} \in \{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = 2n \quad \forall n \in \mathbb{Z}\} \\
&x^{2n} + x^{-1} + -x^{2n} = x^{-1} \notin \{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = 2n \quad \forall n \in \mathbb{Z}\}
\end{aligned}$$

Thus $\{0\} \cup \{p \in P(\mathbb{F}) : deg\ p = 2n \quad \forall n \in \mathbb{Z}\}$ is not closed Under Addition so not a subspace