

Test 2

Problem	1	2	3	4	5	Grade
Points						

NAME: Solution Key

Show all your work for full credit. Crib sheets and notes are not allowed.

Problem 1. Determine if the set W is a subspace of P_2 :

1. $W = \{p \in P_2 \mid \int_0^1 p(t) dt = 0\}$

 P_2 is a vector space and W is its subset.1. $\theta \in W$? $\theta(t)$ is the zero polynomial.

$$\int_0^1 \theta(t) dt = \int_0^1 0 dt = 0. \checkmark$$

2. Closed under addition? Let $p, q \in W$. Then $\int_0^1 p dt = \int_0^1 q dt = 0$.

$$\int_0^1 (p(t) + q(t)) dt = \int_0^1 p(t) dt + \int_0^1 q(t) dt = 0 + 0 = 0$$

$$\Rightarrow p + q \in W. \checkmark$$

3. Closed under scalar multiplication? Let $p \in W$.

$$\int_0^1 c p(t) dt = c \int_0^1 p(t) dt = c \cdot 0 = 0 \Rightarrow c p \in W \Rightarrow W \text{ is a subspace of } P_2$$

2. $W = \{p \in P_2 \mid p'(t) + p(t) = 1\}$

$$\theta'(t) \equiv 0, \quad \theta'(t) + \theta(t) = 0 + 0 = 0 \neq 1.$$

 $\Rightarrow \theta(t) \notin W$. W is NOT a subspace of P_2 .