Math 54: HW #6

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Solution:

a.) Yes. The sum of non negative numbers can never be nonnegative.

b.) $u = [1, 1]$ and $c = -1$.

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Solution:

a.) Yes. c will change the sign of both x, y.

b.) $u = [1, 0]$ and $v = [0, -1]$

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Solution: Yes. Subspace of P_2, addition and multiplication hold.

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Solution: No, not a subspace. Multiplying by scalar makes it not longer in the form of $a + t^2$.

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Solution: The set trivially contains the zero vector. Let some function $p_1(t), p_2(t)$ be in the set. $(p_1 + p_2)(0) = 0 + 0 = 0$, set is closed under addition. For any scalar $c, (cp)(t) = cp(t)$, so the set is closed under multiplication.

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Solution: $u = [510]$ and $v = [201]$. It shows that W is a subspace of $\mathbb{R}^3$ because they are linearly independent.

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Solution:

a.) Prove the continuous functions have zero vector and are closed under addition and subtraction.

b.) First, showing it contains zero vector. We can just define a $C[0,0] : f(0) = f(0)$, which holds. Next, showing it's closed under addition: $\forall f, g \in$ the set $, (f + g)(a) = f(a) + g(a) = f(b) + g(b) = (f + g)(a)$. Finally, showing it's closed under scalar multiplication, which is trivial by observation.

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Solution: True. Addition holds because (2,1) will always be $0+0$. Zero holds because a=b=d=0 is a valid case. Scalar holds as $c * 0 = 0$.

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Solution: Yes.

zero condition: Let $A = 0$ matrix, $FA = 0 \implies \vec{0} \in H$

addition closure: $F(A_1 + A_2) = FA_1 + FA_2 = 0 + 0 = 0$, which is in H, so it is closed.

scalar closure: $c * 0 = 0$, so it is closed.

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Solution:

a.) False. Most functions have some $t : f(t) = 0$.

b.) False. Vectors exist outside of 3D space.

c.) False. You also need to show it is closed under addition/scaling.

d.) True. Definitional.

e.) False. Not mentioned in introduction to chapter.

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Solution: H has to contain $spanu, v$ because vector spaces are closed under linear combinations, which is what the definition of span is.

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Solution: zero condition: 0 was in H and K by definition of subspaces, so it is in the intersection as well.

addition closure: any two vectors that were in both planes must've also been closed under both original subspaces, so their additions are in the intersections.

scalar closure: similar argument to addition.