Math 24
Winter 2017

Sample Quiz Questions

January 11, 2017

These are examples of the kinds of questions that may be asked on x-hour quizzes. Generally, proofs on quizzes will be limited to very simple or concrete things. (Example: Let $S = \{(1,2,3),(2,2,4)\}$. Show that $(1,2,1)$ is not in the span of S.) You may be tested on knowing definitions and theorems, as well as how to solve problems. (Example: Find all solutions to the following system of equations.) You may also be asked to give examples or counterexamples. These are questions that could be asked on a quiz on sections 1.2 and 1.3. Sample solutions are on the next page.

1. Complete the sentence:

   "The set X is closed under addition" means:

2. **True or False?** The existence of an additive identity element is a theorem about vector spaces.

   Answer (circle one): TRUE FALSE

   Brief explanation:

3. **True or False?** If v is an element of a vector space V over $\mathbb{R}$, then $v + v = 2v$.

   Answer (circle one): TRUE FALSE

   No explanation required.

4. Give a counterexample to show that the union of subspaces of a vector space V may not be a subspace of V. You do not need to show your answer is correct.

5. Give a geometric description of the smallest subspace of $\mathbb{R}^3$ containing the x-axis and the line $x = y = z$. You do not need to show your answer is correct.

1. Complete the sentence:

   "The set X is closed under addition" means:

   $\boxed{\text{For every } x \text{ and } y \text{ in } X, \text{ the sum } x+y \text{ is in } X.}$

2. **True or False?** The existence of an additive identity element is a theorem about vector spaces.

   Answer (circle one): TRUE $\boxed{\text{FALSE}}$

   Brief explanation: $\boxed{\text{It's part of the definition of vector space.}}$

3. **True or False?** If v is an element of a vector space V over $\mathbb{R}$, then $v + v = 2v$.

   Answer (circle one): $\boxed{\text{TRUE}}$ FALSE

   No explanation required. But here's one anyway.

   $$v + v = (1v) + (1v) = (1 + 1)v = 2v.$$

   Each step can be justified by one of the vector space axioms.

4. Give a counterexample to show that the union of subspaces of a vector space V may not be a subspace of V. You do not need to show your answer is correct.

   $\boxed{\text{The } x\text{-axis and the } y\text{-axis are subspaces of } \mathbb{R}^3, \text{ but their union is not.}}$

5. Give a geometric description of the smallest subspace of $\mathbb{R}^3$ containing the x-axis and the line $x = y = z$. You do not need to show your answer is correct.

   $\boxed{\text{The plane with equation } y = z.}$

   or

   $\boxed{\text{The plane with normal vector } (0, 1, -1).}$