

Math 110 HW1

Neo Lee

09/02/2023

Problem 1

Determine which complex numbers x satisfy the equation $x^3 + x^2 + x + 1 = 0$.

Problem 2

Does there exist a complex number λ such that $\lambda(2 - 3i, 5 + 4i, -6 + 7i) = (2 + i, 3 - i, 4)$?

Problem 3

Suppose that $\{0, 1, x\}$ is a field with exactly three elements. What do the addition and multiplication tables have to be in that case? Based on the addition and multiplication tables you get, check this is indeed a field. What is the 'natural' way to think of this field (and of x)?

Problem 4

Suppose a is a fixed real number, and consider the set of all real-valued twice differential functions f on the interval $[0, \infty)$ such that $f''(2) + af'(1) - af(0) = 2a$ (equipped with the usual addition of functions and multiplication by real scalars). For which values of a is this a vector space over \mathbb{R} ?

Problem 5

Suppose S is a non-empty set and V is a vector space. Let V^S denote the set of functions from S to V . Define a natural addition and scalar multiplication on V^S , and show that V^S is a vector space with these definitions.