

Coding the Matrix — Written Questions

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Here we will have the written answers to selected problems that do not require code or drawings to solve.

1 The Field

1.1

1.2

1.3

1.4

1.5

1.6 Review

1. The complex numbers, the reals, and the integers.
2. $z.\text{real} - z.\text{imag}$, and the formula for the absolute value of a complex number is $z * z_c$
3. Adding the real and imaginary components separately.
4. Putting them in an equation and using distributive property.
5. Adding two complex numbers together.
6. Multiplying a real number by a complex number.
7. Multiplying by -1.
8. Multiplying by $e^{\frac{\pi i}{2}}$.
9. Adding the two bits and then applying modulo 2.
10. Setting the result to 0 if one of the bits is 0 and 1 otherwise.

1.7 Problems

1. (a) $5 + 3i$
(b) i
(c) $-1 + 0.001i$
(d) $0.001 + 9i$
2. (a) e^{3i}
(b) $e^{(\frac{11\pi}{12})i}$
(c) $e^{(\frac{5\pi}{12})i}$
3. (a) $a = (2)(e^{(\frac{\pi}{2})i})$, $b = 1 + 1i$
(b) Not possible to scale the real part by two and imaginary part by three in only one multiplication.
4. (a) $1 + 1 + 1 + 0 = (1 + 1) + (1 + 0) = (0) + (1) = 1$
(b) 0

2 The Vector

2.6 Combining Vector Addition and Scalar Multiplication

1. $[3, 4]$, and the translation vector is $[2, 3]$.
2. $\{\alpha[5, -1] + [1, 4] : \alpha \in \mathbb{R}, 0 \leq \alpha \leq 1\}$