

Ex] Let's Explore

$$\mathbb{Z}[i] / \langle 4+i \rangle$$

Factor ring  
commutative  
ring w/ unity

$$\mathbb{Z}[i] = \{a+bi \mid a, b \in \mathbb{Z}\}$$

$$\langle 4+i \rangle = \{r(4+i) \mid r \in \mathbb{Z}[i]\}$$

$$\underbrace{(4-i)(4+i)}_{\in \mathbb{Z}[i]} = 17 \in \langle 4+i \rangle$$

$$\mathbb{Z}[i] / \langle 4+i \rangle = \{r + \langle 4+i \rangle \mid r \in \mathbb{Z}[i]\}$$

$$3+2i + \langle 4+i \rangle = (-1+i) + \langle 4+i \rangle$$

$$(4+i - 1+i) + \langle 4+i \rangle$$

$$-1+i + (4+i) + \langle 4+i \rangle$$

$$(-1+i) + 0 + \langle 4+i \rangle$$

$$4 + \langle 4+i \rangle = -i(i+4) + \langle 4+i \rangle = \underline{-i + \langle 4+i \rangle}$$

$$i + \langle 4+i \rangle = -4 + \langle 4+i \rangle$$

$$(7+5i) + \langle 4+i \rangle \in \mathbb{Z}[i] / \langle 4+i \rangle$$

$$\rightarrow (7+5(-4)) + \langle 4+i \rangle = -13 + \langle 4+i \rangle$$

$$\mathbb{Z}[i] / \langle 4+i \rangle$$

$$\cong \mathbb{Z}_{17}$$

$\mathbb{Z}[i] / \langle 2 \rangle$

$$18 + \langle 4+i \rangle = 1+17 + \langle 4+i \rangle = 1 + \langle 4+i \rangle$$

$$-3 + \langle 4+i \rangle = 17-3-17 + \langle 4+i \rangle = 14 + \langle 4+i \rangle$$

$$\mathbb{Z}[x] = \{a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0 \mid a_i \in \mathbb{Z}\}$$

$$\langle a_1, a_2, \dots, a_n \rangle = \{r_1 a_1 + r_2 a_2 + \dots + r_n a_n \mid r_i \in \mathbb{R}\}$$

ideal of  $\mathbb{R}$

# Day #1 Board Notes

Homework:

- Consider  $\mathbb{Z}[i] / \langle 2 \rangle$
- work w/ group on poster rough draft

- Penultimate
- Homework #1 ch 4 2 is

posted on uwlax homepage.

So good to see you all today!

:-)