

P3 – Imaginary Numbers

Prep

2.1 Complex Number Operations

Some of the standard operations you can do with complex numbers is addition, subtraction, multiplication and division.

2.2 Complex Number Class

```
class Comp {
public:

    Comp() {
        re = 0;
        im = 0;
    }

    Comp(int imaginary) {
        im = imaginary;
    }

    Comp(int real, int imaginary) {
        re = real;
        im = imaginary;
    }
}
```

```
Comp operator= (const Comp &n) {
    //a + bi = c + di
}

Comp operator= (const int n) {
    //a + bi = n + 0i
}

Comp operator+ (const Comp &n) {
    //(a + bi) + (c + di) = (a + c) + (b + d)i
}

Comp operator+ (const int n) {
    //(a + bi) + n = (a + n) + (b + n)i
}

Comp operator- (const Comp &n) {
    //(a + bi) - (c + di) = (a - c) + (b - d)i
}

Comp operator- (const int n) {
    //(a + bi) - n = (a - n) + (b - n)i
}

Comp operator* (const Comp &n) {
    //(a + bi) * (c + di) = (ac - bd) + (ad + bc)i
}

Comp operator* (const int n) {
    //(a + bi) * n = (an) + (bn)i
}

Comp operator/ (const Comp &n) {
    //(a + bi) / (c + di) = (ac + bd) / (c^2 + d^2) + (bc - ad)i / (c^2 + d^2)
}

Comp operator/ (const int n) {
    //(a + bi) / n = (a / n) + (b / n)i
}
```

2.3 Impedance of Circuits

- i. The real part of a series RLC circuit is the resistor.
- ii. The reactive part is the $X_L - X_C$. Where X_L is ωL and X_C is $1/\omega C$.

```
Comp calculateImpedance(Comp r, Comp l, Comp c, int freq) {  
  
    int ang = 2 * M_PI * freq;  
  
    l = l * ang;  
    c = c * ang;  
  
    return r + (l - c);  
}
```

- iii.
- iv. Impedance is the amount of opposition to the charge flow in a circuit, it is what mathematically links voltage and current.