2.4 Complex Numbers Day 1

Intro: $x^2 + 1 = 0$

$x^2 = -1$

$x = \pm\sqrt{-1}$

$i = \sqrt{-1}$

$i^2 = -1$

Complex Numbers--standard form = a + bi

real imaginary

Let's take a look at what happens if...

$i = \sqrt{-1}$

$i^2 = -1$

$i^3 = i^2 \cdot i = -1 \cdot \sqrt{-1} = -1 \cdot i = -i$

$i^4 = i^3 \cdot i = -i \cdot i = -i^2 = 1$

$i^5 = i^4 \cdot i = 1 \cdot i = i$

$i^6 = i^5 \cdot i = i \cdot i = i^2 = -1$

$i^7 = i^6 \cdot i = -1 \cdot i = -i$

$i^8 = i^7 \cdot i = -i \cdot i = -i^2 = 1$

$i^{25} = i^1 = i$

$25 \div 4 = 6$ R1

$i^{31} = i^3 = -i$

$7 \cdot 4 = 28$ R3

Adding and Subtracting Complex Numbers:

Sum: (a + bi) + (c + di) = (a + c) + (b + d)i

Difference: (a + bi) - (c + di) = (a - c) + (b - d)i

Ex 1) (3 - i) + (2 + 3i) = $5 + 2i$

Ex 2) 2i + (-4 - 2i) = -4

Ex 3) 3 - (-2 + 3i) + (-5 + i) = $5 - 3i - 5 + i = -2i$

Ex 4) (3 + 2i) + (4 - i) - (7 + i) = $i - i = 0$

Multiplication of Complex Numbers

Ex 5) $\sqrt{(-4)} \cdot \sqrt{(-16)} = \sqrt{-1} \cdot \sqrt{4}$, $i \cdot 2 = 2i$; $2i \cdot 4i = 8i^2 = 8 \cdot -1 = -8$

Ex 6) (2 -i)(4 + 3i) = $8 + 6i + -4i - 3i^2 = 8 + 2i + 3 = 11 + 2i$

Ex 7) 4i(-1 + 5i) = $-4i + 20i^2 = -4i - 20 = -20 - 4i$

Ex 8) $(3 + 2i)^2 = (3 + 2i)(3 + 2i)$

$= 9 + 6i + 6i + 4i^2$

$= 9 + 12i - 4$

$= 5 + 12i$