Complex Numbers

10/23

$\sqrt{25} = 5$

b/c $5 \cdot 5 = 25$

$\sqrt{25} = -5$

b/c $-5 \cdot -5 = 25$

$\sqrt{-25}$

imaginary number

(complex number)

Definition: $i = \sqrt{-1}$

Thus…..

$i^2 = (\sqrt{-1})^2 = -1$

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

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

$i^5 = i^3 \cdot i^2 = -i \cdot -1 = i$

$i^2 \cdot i^2 \cdot i$
$-1 \cdot -1 \cdot i$

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

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

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

$i^8 = i^4 \cdot i^4 = 1 \cdot 1 = 1$

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

$i^5 = i$
$i^6 = -1$
$i^7 = -i$
$i^8 = 1$

$i^9 = i$
$i^{10} = -1$
$i^{11} = -i$
$i^{12} = 1$

So…what's i^{23}

$i^{20} \cdot i^{3}$

$1 \cdot -i$

$-i$

Simplify:

$i^{18} = -1$

$i^{16} \cdot i^{2}$

$1 \cdot -1$

-1

i^{17}

$i^{16} \cdot i$

$1 \cdot i$

i

i^{19}

$i^{16} \cdot i^{3}$

$-i$

i^{25}

$i^{24} \cdot i$

$1 \cdot i$

i

$4\overline{)25}$ 6, 24

$i^{12} = 1$

$i^{4} \cdot i^{4} \cdot i^{4}$

i^{21}

$i^{20} \cdot i$

$1 \cdot i = i$

$4\overline{)21}$ 5, 20

$i^{101} = i$

$i^{100} \cdot i$

$1 \cdot i = i$

$4\overline{)101}$ 25, 100

$i^{24} = 1$

$i^{4} \cdot i^{4} \cdot i^{4} \cdot i^{4} \cdot i^{4} \cdot i^{4}$

$1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$

$i^{39} = -i$

$i^{36} \cdot i^{3}$

$1 \cdot -i$

$-i$

$i^{38} \cdot i$

$i^{36} \cdot i^{2} \cdot i$

$-1 \cdot i$

$4\overline{)39}$ 9, 36

Simplify: $i = \sqrt{-1}$

$\sqrt{-49}$

$\sqrt{-1} \cdot 49$

$7i$

$\sqrt{-5}$

$\sqrt{-1}\sqrt{5}$

$i\sqrt{5}$

Simplify:

$\sqrt{-32}$

$i\sqrt{32}$

$i\sqrt{16 \cdot 2}$

$4i\sqrt{2}$

$\sqrt{-20}$

$i\sqrt{4 \cdot 5}$

$2i\sqrt{5}$

$(2i)^2$

$2^2 \; i^2$

$(4)(-1)$

-4

$(-3i)(5i)$

$-15\,i^2$

$(-15)(-1)$

15

Simplify:

Like terms: real w/ real
imag w/ imag

$$(3+4i)+(7-6i)$$

$3+4i+7-6i$

$10-2i$

real ± imaginary

Simplify:

$$(8-2i)-(7+3i)$$

$8-2i-7-3i$

$1-5i$

Simplify:

$$(8+2i)-(-3-6i)$$

$8+2i+3+6i$

$11+8i$

Multiply:

$$i(3+2i)$$

$3i + 2i^2$

$3i + 2(-1)$

$3i - 2$

$-2 + 3i$

$(2i)(3i)(4+2i)$

$6i^2(4+2i)$

$6 \cdot -1$

$-6(4+2i)$

$-24 - 12i$

Multiply: $(3-5i)(7-2i)$

$21 - 6i - 35i + 10i^2$

$21 - 41i + 10(-1)$

$11 - 41i$