Simplifying Powers of *i* (Change the calculator **Mode** to *a + bi*)

$i = \sqrt{-1}$ $i^2 = -1$ $i^3 = -i$ $i^4 = 1$

To simplify higher powers of *i*, Divide the exponent by 4 and find the remainder.

No remainder: answer is 1. Remainder of 1: answer is i.

Remainder of 2: answer is -1. Remainder of 3: answer is $-i$.

$i^{23} = -i$	$i^{2006} = -1$	$i^{37} = i$	$i^{828} = 1$
i^{45} i	$i^{400} = 1$	$i^{67} = -i$	i^{58} -1

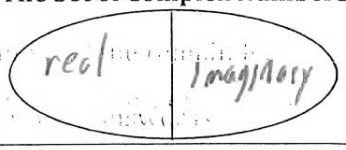
Operations with Complex Numbers

Complex Numbers, *a + bi*

a = real **bi** = imaginary

Conjugate of a + b*i* is $a - bi$

The Set of Complex Numbers



+ – x / With Complex Numbers – By hand, check in the calculator ☺

$7i + 9i = 16i$	$(-5 + 6i) + (2 - 11i)$ $-3 - 5i$	$(2 + 3i) - (4 + 2i)$ $-2 + i$
$(-3 + 4i) - (1 + 3i)$ $-4 + i$	$(2 + 5i)(7 + 2i)$ $14 + 4i + 35i + 10i^2$ $14 + 39i - 10$ $4 + 39i$	$(7 - 4i)(3 + 4i)$ $21 + 28i - 12i - 16i^2$ $21 + 16i + 16$ $37 + 16i$
$(2 + 3i)(14 + 8i)$ $28 + 16i + 42i + 24i^2$ $28 + 58i - 24$ $4 + 58i$	$(3 - 4i) + (2 - 7i) - (5 - 12i)$ i	$(5 - 4i)(-11 + 15i)$ $-55 + 75i + 44i - 60i^2$ $-55 + 119i + 60$ $5 + 119i$

How to divide by hand: Multiply the top and bottom by the conjugate of the bottom!

$$\frac{(-3 + i)}{(5 - 2i)} \cdot \frac{(5 + 2i)}{(5 + 2i)} = \frac{-15 - 6i + 5i + 2i^2}{25 + 10i - 10i - 4i^2} = \frac{-15 - i - 2}{25 + 4} = \frac{-17 - i}{29}$$

$(60 + 90i) \div (14 + 8i)$ $\frac{60 + 90i}{14 + 8i} \cdot \frac{(14 - 8i)}{(14 - 8i)}$ $\frac{840 - 480i + 1260 - 720i^2}{196 - 112i + 112i - 64i^2}$ $\frac{1560 + 780i}{260} = 6 + 3i$	$\frac{(-33 - 56i)}{(5 - 12i)} \cdot \frac{(5 + 12i)}{(5 + 12i)}$ $\frac{-165 - 396i - 280i - 672i^2}{25 + 60i - 60i - 144i^2}$ $\frac{507 - 676i}{169} = 3 - 4i$	$(-63 + 23i) \div (-11 + 15i)$ $\frac{-63 + 23i}{-11 + 15i} \cdot \frac{(-11 - 15i)}{(-11 - 15i)}$ $\frac{693 + 945i - 253i - 345i^2}{121 + 165i - 165i - 225i^2}$ $\frac{1038 + 692i}{346} = 3 + 2i$