Complex Numbers

Recall from last year that the graphs of some quadratic functions do not cross the x-axis. These functions have roots (x-intercepts) that are members of the ***complex number system***

A complex number is of the form $a+bi$ where a and b are real numbers and

$\boxed{i=\sqrt{-1}}$ *

$\boxed{i^2=-1}$ *

Write as a complex number: a+bi

$\sqrt{-9}$

$\sqrt{9}\cdot\sqrt{-1}$

$\boxed{3i}$

$\sqrt{-12}$

$\sqrt{12}\cdot\sqrt{-1}$

$\sqrt{4\cdot 3}\cdot i$

$\boxed{2i\sqrt{3}}$

$\sqrt{-64}$

$\sqrt{64}\cdot\sqrt{-1}$

$\boxed{8i}$

Simplify the following:

$(2+3i)+(4-6i)$

$2+3i+4-6i$

$6-3i$

$a=6$

$b=-3$

$3(2+6i)-3(4+2i)$

$6+18i-12-6i$

$-6+12i$

$a=-6$

$b=12$

Find each product:

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

$12-3i+8i-2(i^2)$

$12+5i-2(-1)$

$12+5i+2$

$\boxed{14+5i}$

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

$4\cancel{-6i}\cancel{+6i}-9(i^2)$

$4-9(-1)$

$4+9$

$\boxed{13}$

You may have noticed in the last example the product resulted in the real number **13.** This is because $(2+3i)$ and $(2-3i)$ are called ***complex conjugates***

In general $a+bi$ is the complex conjugate of $a-bi$

$-3+2i$ " " " " " $-3-2i$

Use complex conjugates to solve the following:

"Realize the denominator"

$\frac{3}{2i} \cdot \frac{i}{i}$

$\frac{3i}{2i^2}$

$\frac{3i}{-2}$

$\boxed{-\frac{3i}{2}}$

$a=0$

$b=-\frac{3}{2}$

$\frac{(2+3i)}{(4-2i)} \frac{(4+2i)}{(4+2i)}$

$\frac{8+4i+12i+6i^2}{16-4i^2}$

$\frac{8+16i-6}{16+4}$

$\frac{2+16i}{20} \rightarrow \frac{1+8i}{10}$

$\frac{2}{20} + \frac{16i}{20}$

$\boxed{\frac{1}{10} + \frac{4i}{5}}$

$a=\frac{1}{10}$

$b=\frac{4}{5}$

Homework
#1-7
Omit 3 b, c