Precalculus 2.4 Complex Numbers

The imaginary unit, i, is defined as $i = \sqrt{-1}$

Powers of i: $i^2 = -1$ $i^3 = -i$ $i^4 = 1$

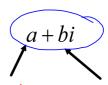
-to simplify $\sqrt{-45}$, first get in terms of i

$$\sqrt{45} * \sqrt{-1} = \sqrt{9} * \sqrt{5} * \mathbf{i} = 3\mathbf{i}\sqrt{5}$$

Example Simplify into terms of $i \sqrt{-60}$

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- a complex number written in standard form is both a and b are real numbers



5 + 6i

real part imaginary part

3-21

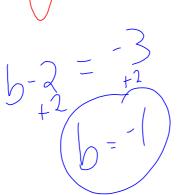
-two complex numbers are equal if all their parts are equal.

$$a + bi = c + di$$

if and only if
$$a = c$$
 and $b = d$

Find the real numbers a and b so that,

$$a+(b-2)i=7-3i$$



-8(-1)

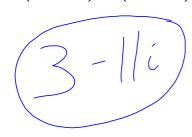
Operations with Complex Numbers

-When adding, subtracting, or multiplying treat *i* like a variable and go with like terms.

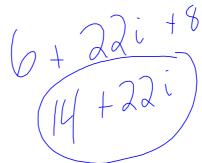
Examples

Perform the operation and write answer in standard form

(7-6i)-(4+5i)



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



-When dividing by a complex number, you multiply the numerator and denominator by conjugate of the denominator.

-Complex conjugate is obtained by switching the sign of the imaginary

term. For example, the conjugate of

Example

Perform the operation and write answer in standard form
$$\frac{(2+3i)}{(4-5i)} \cdot \frac{(4+5i)}{(4+5i)} = \frac{8+(0i+12i+15i)}{(6+20i-20i-25i)}$$

