GSE Alg. II
Name: ____________________________________ Date: _________________ Per: __________
U1 Lesson 1.5 Guided Notes

Example 1 Square Roots of Negative Numbers
Simplify.

a. $\sqrt{-72}$

$\sqrt{-72} = \sqrt{-1 \cdot 2 \cdot 6^2}$
$= \sqrt{-1} \cdot \sqrt{2} \cdot \sqrt{6^2}$
$= i \cdot 6 \cdot \sqrt{2} = 6i\sqrt{2}$

b. $\sqrt{-108b^7}$

$\sqrt{-108b^7} = \sqrt{-1 \cdot 6^2 \cdot b^6 \cdot 3b}$
$= \sqrt{-1} \cdot \sqrt{6^2} \cdot \sqrt{b^6} \cdot \sqrt{3b}$
$= i \cdot 6 \cdot b^3 \cdot \sqrt{3b}$ or $6b^3 i\sqrt{3b}$

Example 2 Products of Pure Imaginary Numbers
Simplify.

a. $(-9i) \cdot (-5i)$

$(-9i) \cdot (-5i)$	$= 45i^2$	Multiply.
	$= 45(-1)$	$i^2 = -1$
	$= -45$	Simplify.

b. $2\sqrt{-72} \cdot (-3)\sqrt{-50}$

$2\sqrt{-72} \cdot (-3)\sqrt{-50}$	$= 2i\sqrt{72} \cdot (-3i)\sqrt{50}$	$i = \sqrt{-1}$
	$= -6i^2\sqrt{3600}$	Multiply.
	$= -6i^2\sqrt{60^2}$	Simplify.
	$= -6(-1)(60)$	Multiply.
	$= 360$	Simplify.

Example 3 Equation with Pure Imaginary Solutions
Solve $4x^2 + 100 = 0$.

$4x^2 + 100 = 0$	Original equation
$4x^2 = -100$	Subtract 100 from each side.
$x^2 = -25$	Divide each side by 4.
$x = \pm\sqrt{-25}$	Square Root Property
$x = \pm 5i$	$\sqrt{-25} = \sqrt{25} \cdot \sqrt{-1}$

Example 4 Equate Complex Numbers
Find the values of *a* and *b* that make the equation $a + 4 + (2b - 6)i = 7 + 9i$ true.

Set the real parts equal to each other and the imaginary parts equal to each other.

$a + 4 = 7$	Real parts	$2b - 6 = 9$	Imaginary parts
$a = 3$	Subtract 4 from each side.	$2b = 15$	Add 6 to each side.
		$b = 7.5$	Divide each side by 2.

Example 5 Add and Subtract Complex Numbers

Simplify.

a. (–7 + 5*i*) + (12 + 3*i*)

(–7 + 5*i*) + (12 + 3*i*)

= (–7 + 12) + (5 + 3)*i* — Commutative and Associative Properties

= 5 + 8*i* — Simplify.

b. (6 + 3*i*) – (–1 – 4*i*)

(6 + 3*i*) – (–1 – 4*i*)

= [6 – (–1)] + [3 – (–4)]*i* — Commutative and Associative Properties

= 7 + 7*i* — Simplify.

Example 6 Multiply Complex Numbers

ELECTRICITY In an AC circuit, the voltage *E*, current *I*, and impedance *Z* are related by the formula $E = I \cdot Z$. Find the voltage in a circuit with current 2 + 5*j* amps and impedance 8 – 3*j* ohms.

$E = I \cdot Z$	Electricity formula
= (8 – 3j)(2 + 5*j*)	*I* = 8 – 3*j*, *Z* = 2 + 5*j*
= 8(2) + 8(5*j*) + (-3*j*)(2) + (-3*j*)(5*j*)	FOIL
= 16 + 40*j* – 6*j* – 15j^2	Multiply.
= 16 + 34*j* – 21(-1)	j^2 = -1
= 37 + 34*j*	Add.

The voltage is 37 + 34*j* volts.

Example 7 Divide Complex Numbers

Simplify.

a. $\dfrac{-2}{3+5i}$

$\dfrac{-2}{3+5i} = \dfrac{-2}{3+5i} \bullet \dfrac{3-5i}{3-5i}$ — 3 + 5*i* and 3 – 5*i* are conjugates.

$= \dfrac{-6+10i}{9-25i^2}$ — Multiply.

$= \dfrac{-6+10i}{34}$ — $i^2 = -1$

$= -\dfrac{3}{17} + \dfrac{5}{17}i$ — Standard form

b. $\dfrac{6-7i}{3i}$

$\dfrac{6-7i}{3i} = \dfrac{6-7i}{3i} \bullet \dfrac{-3i}{-3i}$ — Multiply by $\dfrac{-3i}{-3i}$.

$= \dfrac{-18i+21i^2}{-9i^2}$ — Multiply.

$= \dfrac{-21-18i}{9}$ — $i^2 = -1$

$= \dfrac{-7}{3} - 2i$ — Standard form