Operations with "i" notes "i"nspired Student: Date:

We have learned that $\sqrt{-1} = i$ and that we can simplify square roots like $\sqrt{-200}$ using "i", but what else can we do with it?

Simplify each of the following.

1. $(2 + 5x) + (8 - 2x)$

$10 + 3x$

2. $(2 + 5x) - (8 - 2x)$

$-8 + 2x$

$-6 + 7x$

3. $(2 + 5x)(8 - 2x)$

$-10x^2 + 36x + 16$

	2	$5x$
8	16	$40x$
$-2x$	$-4x$	$-10x^2$

4. $(4 - 3x)(12 - 2x)$

5. $(2 + 5i) + (8 - 2i)$

$10 + 3i$

6. $(2 + 5i) - (8 - 2i)$

$-6 + 7i$

7. $(2 + 5i)(8 - 2i)$

$-10i^2 + 36i + 16$

$i^2 = -1$ $-10(-1) + 36i + 16$

$10 + 36i + 16$

$26 + 36i$ (or) $36i + 26$

8. $(4 - 3i)(12 - 2i)$

HW

Practice: Simplify the following

1) $i + 6i$

2) $3 + 4 + 6i$

3) $3i + i$

4) $-8i - 7i$

5) $-1 - 8i - 4 - i$

6) $7 + i + 4 + 4$

7) $-3 + 6i - (-5 - 3i) - 8i$

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

9) $4i(-2 - 8i)$

10) $5i \cdot -i$

11) $5i \cdot i \cdot -2i$

12) $-4i \cdot 5i$

13) $(-2 - i)(4 + i)$

14) $(7 - 6i)(-8 + 3i)$

GCF & Quadratic Formula Station

1) Find the GCF and solve.

$16x^4 - 8x^3 + 12x^2 = 0$

$(4x^2)(4x^2 - 2x + 3) = 0$

$4x^2 = 0$

$\frac{4x^2}{4} = \frac{0}{4}$

$x^2 = 0$

$x = 0$

$4x^2 - 2x + 3 = 0$

$x = \frac{2 \pm \sqrt{(-2)^2 - 4(4)(3)}}{2(4)}$

$= \frac{2 \pm \sqrt{-44}}{8}$

$\sqrt{-44}$

$\sqrt{-1}\ \sqrt{4}\ \sqrt{11}$

$i\,2\sqrt{11}$

$= \frac{2 \pm 2i\sqrt{11}}{8} = \frac{1 \pm i\sqrt{11}}{4}$

2) Find the GCF and solve.

$3x^3 - 15x^2 + 24x$

$x = 0$ $\quad x = \frac{-2 \pm i\sqrt{6}}{2}$

3) Find the GCF and solve.

$8x^3 + 16x^2 + 20x = 0$

$x = 0$ $\quad x = \frac{5 \pm i\sqrt{7}}{2}$

4) Find the GCF and solve.

$3x^4 + 18x^3 + 36x^2 = 0$

$x = 0$ $\quad x = -3 \pm i\sqrt{3}$

Solve Using the Quadratic Formula Station

1) Solve

$4x^2+ 8x+10 =0$

$$x = \frac{2 \pm i\sqrt{6}}{2}$$

2) Solve

$2x^2-6x-3=0$

$$x = \frac{-4 \pm 3i}{5}$$

3) Solve

$5x^2+8x+5=0$

$$x = \frac{-8 \pm \sqrt{8^2-4(5)(5)}}{10}$$

$$= \frac{-8 \pm \sqrt{-36}}{10}$$

$$= \frac{-8 \pm 6i}{10}$$

$$= \frac{-4 \pm 3i}{5}$$

4) Solve.

$-8x^2-6x+-9=0$

$$x = \frac{-3 \pm 3\sqrt{7}}{8}$$

Simplify the Square Root

1) Simplify

$$\sqrt{-112}$$

$\sqrt{-1}\ \sqrt{16}\ \sqrt{7}$

$i \cdot 4 \cdot \sqrt{7}$

$4i\sqrt{7}$

2) Simplify

$$\sqrt{-60}$$

$2i\sqrt{15}$

3)Simplify

$$\sqrt{-76}$$

$2i\sqrt{19}$

4) Simplify

$$\sqrt{540}$$

$\sqrt{36}\ \sqrt{15}$

$\boxed{6\sqrt{15}}$

5) Simplify

$$\sqrt{117}$$

$3\sqrt{13}$

6) Simplify

$$\sqrt{245}$$

$7\sqrt{5}$

Simplify the Complex Numbers

1) $(4+2i)-(8+6i)$

$4+2i-8-6i$

$-4-4i$

2) $(4+2i)(8+6i)$

$32+24i+16i+12i^2$

$32+40i+12i^2$

$32+40i+12(-1)$

$32+40i-12$

$20+40i$

3) $(12-4i)+(7-6i)$

$19-10i$

4) $(5-9i)(8+3i)$

$67-57i$

5) $6i(4-8i)$

$24i-48i^2$

$24i-48(-1)$

$24i+48$

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

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

$4(-6+3i)$

$-24+12i$

7) $(12+16i)-(4-10i)$

$8+26i$

8) $18+i-(14-2i)$

$-14+2i$

$4+3i$

Topic 6 Study Guide Super Studier: Date:

Solve the following.

1. $x(x-5)=0$

$x=0$ $x-5=0$

$x=5$

2. $(2x+3)(x+6)=0$

$2x+3=0$ $x+6=0$

$2x=-3$ $x=-6$

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

3. $(4x+1)(8x-12)(x+3)=0$

$4x+1=0$ $8x-12=0$ $x+3=0$

$4x=-1$ $8x=12$ $x=-3$

$x=\frac{-1}{4}$ $x=\frac{12}{8}$

4. $x(x-1)(7x+3)(10x-5)=0$

5. A polynomial graph has roots at (-1, 0), (4, 0), and (9, 0). Write a function that could match this graph.

$x=-1$ $x+1=0$ $f(x)=(x+1)(x-4)(x-9)$

$x=4$ $x-4=0$

$x=9$ $x-9=0$

6. Simplify the following.

a. $(12+6i)-(8-9i)$

$12+6i \quad -8+9i$

$4+15i$

or

$15i+4$

b. $(12+6i)(8-9i)$

$96-108i+48i-54i^2$

$96-60i-54(-1)$

$96-60i+54$

$150-60i$ or $-60i+150$

7. What does i represent? What does i^2 represent? What about i^3 or i^4?

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

8. $6n^2 - 8n + 6 = 0$

$$\frac{8 \pm \sqrt{8^2 - 4(6)(6)}}{12}$$

$$\frac{8 \pm \sqrt{-80}}{12}$$

$\sqrt{-80}$ → $\sqrt{-1}\sqrt{16}\sqrt{5}$ → $i4\sqrt{5}$

$$\frac{8 \pm 4i\sqrt{5}}{12}$$

$$\frac{8}{12} \pm \frac{4i\sqrt{5}}{12} = \boxed{\frac{2}{3} \pm \frac{i\sqrt{5}}{3}}$$

9. $5x^2 - 4x = -6$

$$\frac{2 \pm i\sqrt{26}}{5}$$

(or)

$$\frac{2}{5} \pm \frac{i\sqrt{26}}{5}$$ (or) $\frac{2 + i\sqrt{26}}{5}$ and $\frac{2 - i\sqrt{26}}{5}$

10. $12t^3 + 6t^2 + 4t = 0$

$$(2t)(6t^2 + 3t + 2) = 0$$

$\boxed{t = 0}$ $\boxed{t = \frac{-3 \pm i\sqrt{39}}{12}}$

11. $x^2 + 5 = -5x$

$$\boxed{x = \frac{-5 \pm \sqrt{5}}{2}}$$

12. $2t^2 + 39 = -18t$

$$\boxed{t = \frac{-9 \pm \sqrt{3}}{2}}$$

13. $4x^3 + 8x^2 - 1x = 0$

$$\boxed{x = \frac{-2 \pm \sqrt{5}}{2}}$$