Name: ____________________ Date: __________ Calc. # ______

Unit 9 Review WS #24 Period: ______

1 – 8. Simplify the following without the use of your calculator.
Express answers in a + bi form (where necessary):

1. i^{19}

2. $i^{12} \bullet i^{15}$

3. $2\sqrt{-108}$

4. $2\sqrt{-28}+\sqrt{-63}$

5. $(3 + 2i) + (-3 + 5i) - (1 + 4i)$

6. $(x - 5i)^2$

7. $(3x - 4i)(3x + 4i)$

8. $3i(1 - 2i)^2$

9 – 12. Solve the following equations and express the answers in a + bi form:

9. $x^2+5x+3=7x-2$

10. $x^2+13x+25=5x$

11. $2x^2 = -2(3x + 6)$

12. $\frac{6+2x}{x}=\frac{x-2}{-2}$

13. Determine all values of k that would result in the equation $x^2+6x+k=0$ having real, rational and *equal* roots (*double* roots).

14. Find the value(s) of k for which the equation $2x^2+8x+k=0$ has *imaginary* roots.

15. Find the value(s) of k for which the equation $x^2 + (k - 4)x + 4 = 0$ has *imaginary* roots.

16. Show that the product of $(3 + 2i)$ and its *conjugate* would be a purely real number.

NOW YOU TRY!

1 – 12. Simplify the following without the use of your calculator. Express answers in a + bi form (where necessary):

1. i^{25}
2. $i^{15} \bullet i^{30}$
3. $(3-6i)^2$
4. $\sqrt{-192}$
5. $(2-\sqrt{-81})+(-3+\sqrt{-49})$
6. $7\sqrt{-12}-\sqrt{-48}$
7. $(4+5i)-(6i-3)-(2+4i)$
8. $(x-2i)^2$
9. $(4i)^3+(9-i)^2$
10. $4i(3-2i)^2$
11. $(x-3i)(x+3i)$
12. $2xi(5-4i)$

13 – 16. Solve the following equations and express the answers in *a + bi* form:

13. $6x^2+3=8x$
14. $3x^2=-2(2x+3)$
15. $2x^2+5=6x$
16. $\frac{-2+3x}{x}=\frac{x+4}{2}$

17. What is value of k for which $3x^2-6x+k=0$ has *real* roots?

18. What is the smallest integer value of k that makes the roots of $x^2-kx+4=0$ *imaginary*?

19. Which value of k will make the roots of $2x^2-4x+k=0$ *imaginary*?

20. Find the value of k for which the $kx^2-8x-2=0$ has "*double*" roots.

21. Find the value(s) of k for which the $2x^2+(k-2)x+2=0$ has *imaginary* roots.

Name: ______________________ Date: __________ Calc. # ______
Unit 9 Review WS #24 Period: ______

1 – 8. Simplify the following without the use of your calculator. Express answers in a + bi form (where necessary):

1. i^{19}

$(i^2)^{9.5}$

$\boxed{-1i}$

2. $i^{12} \bullet i^{15} = i^{27}$

$(i^2)^{13.5}$

$\boxed{-1i}$

3. $2\sqrt{-108}$

$2\sqrt{36 \cdot 3 \cdot -1}$

$2 \cdot 6i\sqrt{3}$

$\boxed{12i\sqrt{3}}$

4. $2\sqrt{-28}+\sqrt{-63}$

$2\sqrt{4 \cdot 7 \cdot -1} + \sqrt{9 \cdot 7 \cdot -1}$

$2 \cdot 2i\sqrt{7} + 3i\sqrt{7}$

$4i\sqrt{7} + 3i\sqrt{7} = \boxed{7i\sqrt{7}}$

5. $(3 + 2i) + (-3 + 5i) - (1 + 4i)$

$-1 - 4i$

$\boxed{-1+3i}$

6. $(x - 5i)^2$ $(x-5i)(x-5i)$

$x^2 - 5xi - 5xi + 25(i^2)$ -1

$\boxed{x^2 - 10xi - 25}$

7. $(3x - 4i)(3x + 4i)$

$9x^2 + 12xi - 12xi - 16(i^2)$ -1

$\boxed{9x^2 + 16}$

8. $3i(1 - 2i)^2$

$3i(1-2i)(1-2i)$

$3i(1-2i-2i+4(i^2))$ -1

$3i(-3-4i)$

$-9i - 12(i^2) = \boxed{12-9i}$

9 – 12. Solve the following equations and express the answers in a + bi form:

9. $x^2+5x+3 = 7x-2$

$-7x+2 \quad -7x+2$

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

$x = \dfrac{2 \pm \sqrt{(-2)^2 - 4(1)(5)}}{2(1)}$

$x = \dfrac{2 \pm \sqrt{-16}}{2} = \dfrac{2 \pm 4i}{2} = \boxed{1 \pm 2i}$

10. $x^2+13x+25 = 5x$

$-5x \quad -5x$

$x^2 + 8x + 25 = 0$

$x = \dfrac{-8 \pm \sqrt{(8)^2 - 4(1)(25)}}{2(1)}$

$x = \dfrac{-8 \pm \sqrt{-36}}{2} = \dfrac{-8 \pm 6i}{2} = \boxed{-4 \pm 3i}$

11. $2x^2 = -2(3x + 6)$

$2x^2 = -6x - 12$

$+6x+12 \quad +6x+12$

$2x^2 + 6x + 12 = 0$

$x = \dfrac{-6 \pm \sqrt{(6)^2 - 4(2)(12)}}{2(2)}$

$x = \dfrac{-6 \pm \sqrt{-60}}{4} = \dfrac{-6 \pm \sqrt{4 \cdot 15 \cdot -1}}{4}$

$= \dfrac{-6 \pm 2i\sqrt{15}}{4} = \boxed{\dfrac{-3 \pm i\sqrt{15}}{2}}$

12. $\dfrac{6+2x}{x} = \dfrac{x-2}{-2}$

$-12 - 4x = x^2 - 2x$

$+12 + 4x \quad +4x + 12$

$0 = x^2 + 2x + 12$

$x = \dfrac{-2 \pm \sqrt{(2)^2 - 4(1)(12)}}{2(1)} = \dfrac{-2 \pm \sqrt{-44}}{2}$

$x = \dfrac{-2 \pm \sqrt{4 \cdot 11 \cdot -1}}{2} = \dfrac{-2 \pm 2i\sqrt{11}}{2} = \boxed{-1 \pm i\sqrt{11}}$

13. Determine all values of k that would result in the equation $x^2+6x+k=0$ having real, rational and *equal* roots (*double* roots).

$(6)^2 - 4(1)(k) = 0$

$36 - 4k = 0$

$-36 \quad -36$

$\dfrac{-4k}{-4} = \dfrac{-36}{-4}$

$\boxed{k = 9}$

14. Find the value(s) of k for which the equation $2x^2+8x+k=0$ has *imaginary* roots.

$(8)^2 - 4(2)(k) < 0$

$64 - 8k < 0$

$-64 \quad -64$

$\dfrac{-8k}{-8} < \dfrac{-64}{-8}$

$\boxed{k > 8}$

15. Find the value(s) of k for which the equation $x^2 + (k - 4)x + 4 = 0$ has *imaginary* roots.

$(k-4)^2 - 4(1)(4) < 0$

$(k-4)(k-4) - 16 < 0$

$k^2 - 4k - 4k + 16 - 16 < 0$

$k^2 - 8k < 0$

$k(k-8) < 0$

$k=0 \mid k=8$

0 8

$\boxed{0 < k < 8}$

16. Show that the product of $(3 + 2i)$ and its *conjugate* would be a purely real number.

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

$9 - 6i + 6i - 4(i^2)$ -1

$= \boxed{13}$

NOW YOU TRY!

1 – 12. Simplify the following without the use of your calculator. Express answers in a + bi form (where necessary):

1. i^{25}

$(i^2)^{12.5}$

$\boxed{1i}$

2. $i^{15} \bullet i^{30} = i^{45}$

$(i^2)^{22.5}$

$\boxed{1i}$

3. $(3-6i)^2$

$(3-6i)(3-6i)$

$9-18i-18i+36i^2$ (-1)

$\boxed{-27-36i}$

4. $\sqrt{-192}$

$\sqrt{64 \cdot 3 \cdot -1}$

$\boxed{8i\sqrt{3}}$

5. $(2-\sqrt{-81})+(-3+\sqrt{-49})$

$(2-9i)+(-3+7i)$

$\boxed{-1-2i}$

6. $7\sqrt{-12}-\sqrt{-48}$

$7\sqrt{4 \cdot 3 \cdot -1}-\sqrt{16 \cdot 3 \cdot -1}$

$7 \cdot 2i\sqrt{3} - 4i\sqrt{3}$

$14i\sqrt{3} - 4i\sqrt{3} = \boxed{10i\sqrt{3}}$

7. $(4+5i)-(6i-3)-(2+4i)$

$4+5i-6i+3-2-4i$

$\boxed{5-5i}$

8. $(x-2i)^2$

$(x-2i)(x-2i)$

$x^2-2xi-2xi+4i^2$ -1

$\boxed{x^2-4xi-4}$

9. $(4i)^3+(9-i)^2$

$64i^3+(9-i)(9-i)$ -1

$64(i^2)^{1.5}+81-9i-9i+i^2$

$64(-1i)+80-18i$

$-64i+80-18i = \boxed{80-82i}$

10. $4i(3-2i)^2$

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

$4i(9-6i-6i+4i^2)$ (-1)

$4i(5-12i)$

$20i-48i^2$ (-1) $= \boxed{48+20i}$

11. $(x-3i)(x+3i)$

$x^2+3xi-3xi-9i^2$ -1

$\boxed{x^2+9}$

12. $2xi(5-4i)$ -1

$10xi-8xi^2$

$\boxed{10xi+8x}$

13 – 16. Solve the following equations and express the answers in *a + bi* form:

13. $6x^2+3=8x$

$-8x \quad -8x$

$6x^2-8x+3=0$

$x=\frac{8\pm\sqrt{(-8)^2-4(6)(3)}}{2(6)}=\frac{8\pm\sqrt{-8}}{12}=\frac{8\pm\sqrt{4\cdot2\cdot-1}}{12}$

$=\frac{8\pm2i\sqrt{2}}{12}=\boxed{\frac{4\pm i\sqrt{2}}{6}}$

14. $3x^2=-2(2x+3)$ $\quad 3x^2=-4x-6$

$+4x+6 \quad +4x+6$

$3x^2+4x+6=0$

$x=\frac{-4\pm\sqrt{(4)^2-4(3)(6)}}{2(3)}=\frac{-4\pm\sqrt{-56}}{6}$

$=\frac{-4\pm\sqrt{4\cdot14\cdot-1}}{6}=\frac{-4\pm2i\sqrt{14}}{6}=\boxed{\frac{-2\pm i\sqrt{14}}{3}}$

15. $2x^2+5=6x$

$-6x \quad -6x$

$2x^2-6x+5=0$

$x=\frac{6\pm\sqrt{(-6)^2-4(2)(5)}}{2(2)}=\frac{6\pm\sqrt{-4}}{4}$

$=\frac{6\pm2i}{4}=\boxed{\frac{3\pm i}{2}}$

16. $\frac{-2+3x}{x}=\frac{x+4}{2}$

$x^2+4x=-4+6x$

$-6x+4 \quad +4-6x$

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

$x=\frac{2\pm\sqrt{(-2)^2-4(1)(4)}}{2(1)}=\frac{2\pm\sqrt{-12}}{2}$

$=\frac{2\pm\sqrt{4\cdot3\cdot-1}}{2}=\frac{2\pm2i\sqrt{3}}{2}=\boxed{1\pm i\sqrt{3}}$

17. What is value of *k* for which $3x^2-6x+k=0$ has *real* roots?

$(-6)^2-4(3)(k)\geq0$

$36-12k\geq0$

$-36 \quad -36$

$\frac{-12k}{-12}\geq\frac{-36}{-12}$

$\boxed{k\leq3}$

18. What is the smallest integer value of *k* that makes the roots of $x^2-kx+4=0$ *imaginary*?

$(-k)^2-4(1)(4)<0$

$k^2-16<0$

$(k+4)(k-4)<0$

$k=-4 \mid k=4$

$-4 \quad 4$

$-4<k<4$

$\boxed{k=-3}$

19. Which value of *k* will make the roots of $2x^2-4x+k=0$ *imaginary*?

$(-4)^2-4(2)(k)<0$

$16-8k<0$

$-16 \quad -16$

$\frac{-8k}{-8}<\frac{-16}{-8}$

$\boxed{k>2}$

20. Find the value of *k* for which the $kx^2-8x-2=0$ has "*double*" roots.

$(-8)^2-4(k)(-2)=0$

$64+8k=0$

$-64 \quad -64$

$\frac{8k}{8}=\frac{-64}{8}$

$\boxed{k=-8}$

21. Find the value(s) of *k* for which the $2x^2+(k-2)x+2=0$ has *imaginary* roots.

$(k-2)^2-4(2)(2)<0$

$(k-2)(k-2)-16<0$

$k^2-2k-2k+4-16<0$

$k^2-4k-12<0$

$(k-6)(k+2)<0$

$k=6 \mid k=-2$

$-2 \quad 6$

$\boxed{-2<k<6}$