$i^0 = 1$
$i = i$
$i^2 = -1$
$i^3 = -i$

Name_____ Date_____

Honors Algebra II – Complex Number Practice Period_____

Express in terms of i

1. $\sqrt{-12}$

$2\sqrt{3}\,i$

2. $-\sqrt{-288}$

$-12\sqrt{2}\,i$

3. $\sqrt{-\frac{289}{121}}$

$\frac{17}{11}i$

4. $\sqrt{-\frac{1}{6}}$

$\frac{\sqrt{6}}{6}i$

Simplify the following expressions. Put each into $a+bi$ form.

5. $(9-6i)-(11-6i)$

-2

6. $\left(\frac{1}{9}+\frac{3}{10}i\right)+\left(-\frac{3}{5}+\frac{3}{2}i\right)$

$\left(\frac{5}{45}-\frac{27}{45}\right)+\left(\frac{3}{10}+\frac{15}{10}\right)i$

$-\frac{22}{45}+\frac{9}{5}i$

7. $52-[(16-3i)-(4+7i)]$

$40+10i$

8. $\sqrt{6}(5-2\sqrt{6}i)+2\sqrt{6}(3+4\sqrt{6}i)$

$5\sqrt{6}-12i+6\sqrt{6}+48i$

$11\sqrt{6}+36i$

9. $(7+8i)(-6-7i)$

$-42-49i-48i-56i^2$

$14-97i$

10. $(2\sqrt{3}+5i)(2\sqrt{3}-5i)$

$12+25=37$

11. $\left(\frac{1}{2}-\frac{3}{2}i\right)^2$

$\frac{1}{4}-\frac{3}{2}i+\frac{9}{4}i^2=-2-\frac{3}{2}i$

12. $(1+\sqrt{2}i)^3$

$1+3\sqrt{2}i+3\cdot 2i^2+2\sqrt{2}i^3$

$-5+\sqrt{2}i$

13. $(i^3-i)(i+i^4)$

$(-i-i)(i+1)$

$-2i(i+1)$

$2-2i$

14. $(3i^5+2i^4+i^3-2)^2$

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

$(2i-i)^2=(2i)^2=4i^2=-4$

15. $\sqrt{-16}\sqrt{-81}$

$4i\cdot 9i=36i^2=-36$

16. $-\sqrt{-5}\sqrt{-10}$

$-\sqrt{5}\,i\sqrt{10}\,i=-\sqrt{50}\,i^2=5\sqrt{2}$

17. $(9i^5)(-2i^2)$

$(9i)(2)=18i$

18. $(-3i^9)(15i^{23})$

$(-3i)(15(-i))=45i^2=-45$

Divide the complex numbers. Answers should NOT have i in the denominator.

19. $\frac{28i}{-4i^3} = \frac{28i}{4i} = \boxed{7}$

20. $\frac{6+4i}{5i} \cdot \frac{5i}{5i} = \frac{30i+20i^2}{-25} = \frac{-20+30i}{-25} = \boxed{\frac{4}{5} - \frac{6}{5}i}$

21. $\frac{12+5i}{-1+2i} \cdot \frac{-1-2i}{-1-2i} = \frac{-12-29i-10i^2}{1-4i^2} = \frac{-2-29i}{5} = \boxed{-\frac{2}{5} - \frac{29}{5}i}$

22. $\frac{9\sqrt{2}+2i}{2\sqrt{2}+i} \cdot \frac{2\sqrt{2}-i}{2\sqrt{2}-i} = \frac{36-5\sqrt{2}i-2i^2}{8-i^2} = \frac{38-5\sqrt{2}i}{9} = \boxed{\frac{38}{9} - \frac{5\sqrt{2}}{9}i}$

23. $\frac{(3-2i)^{-2}}{(4+i)^{-1}} = \frac{4+i}{(3-2i)^2} = \frac{4+i}{9-12i+4i^2} = \frac{4+i}{5-12i} \cdot \frac{5+12i}{5+12i} = \frac{20+53i+12i^2}{25-144i^2} = \frac{8+53i}{169} = \boxed{\frac{8}{169} + \frac{53}{169}i}$

24. $\left(\frac{1+i}{1-i}\right)^3 = \frac{1+3i+3i^2+i^3}{1-3i+3i^2-i^3} = \frac{-2+2i}{-2-2i} \cdot \frac{-2+2i}{-2+2i} = \frac{4-8i+4i^2}{4-4i^2} = \frac{-8i}{8} = \boxed{-i}$

25. $\frac{7+3i}{2-i} \cdot \frac{6+i}{3-i} = \frac{42+25i+3i^2}{6-5i+i^2} = \frac{39+25i}{5-5i} \cdot \frac{5+5i}{5+5i} = \frac{195+320i+125i^2}{25-25i^2} = \frac{70+320i}{50} = \boxed{\frac{7}{5} + \frac{32}{5}i}$

26. $\frac{5-2i}{1+i} - \frac{5+4i}{2+i} = \frac{(5-2i)(2+i)-(5+4i)(1+i)}{(1+i)(2+i)} = \frac{(10+i-2i^2)-(5+9i+4i^2)}{2+3i+i^2} = \frac{12+i-1-9i}{1+3i} = \frac{11-8i}{1+3i} \cdot \frac{(11-8i)}{(1+3i)} \cdot \frac{(1-3i)}{(1-3i)} = \frac{11-41i+24i^2}{1-9i^2} = \boxed{\frac{-13}{10} - \frac{41}{10}i}$

27. If $x = 2 - 3i$, evaluate and simplify $x^2 - 2x + 7$

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

$4 - 12i + 9i^2 - 4 + 6i + 7$

$\boxed{-2 - 6i}$

28. If $x = 1 - i$, evaluate and simplify $2x^2 - x - 3$

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

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

$= -4i - 1 + i - 3 = \boxed{-4 - 3i}$

In the following problems, find a and b such that the statement is true.

29. $(5a-b)+(2b+4a)i = 36+26i$

$5a - b = 36$

$4a + 2b = 26$

$10a - 2b = 72$

$4a + 2b = 26$

$14a = 98$

$a = 7$

$4(7) + 2b = 26$

$2b = -2$

$\boxed{b = -1}$

30. $(2+3i)(a+bi) = 1$

$2a + 2bi + 3ai - 3b = 1$

$(2a - 3b) + (3a + 2b)i = 1$

$2a - 3b = 1$

$3a + 2b = 0$

$4a - 6b = 2$

$9a + 6b = 0$

$13a = 2 \quad a = \frac{2}{13}$

$2\left(\frac{2}{13}\right) - 3b = 1$

$b = -\frac{4}{13}$

$\boxed{a = \frac{13}{2} \quad b = -4}$

31. $8^a + 27i = 2 + 9^b i$

$2^{3a} = 2$

$\boxed{a = 1/3}$

$3^3 = 3^{2b}$

$\boxed{b = 3/2}$

32. $(a+b)+(ab)i = 6+5i$

$a + b = 6$

$ab = 5$

$b = 5/a$

$a + \frac{5}{a} = 6$

$a^2 + 5 = 6a$

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

$(a-5)(a-1) = 0$

$a = 5, 1$

$\boxed{a = 5 \text{ or } b = 1 \quad a = 1 \quad b = 5}$