**WORKSHEET XVIII**

Complex Numbers; Euler’s formula



1. Let z = 2 + 3i and w = 6 – i. Compute and express each of the following in the form a + bi. Plot each number in the complex plane.

1. z + w
2. 5z
3. z – 3w
4. zw
5. 1/z
6. z/w
7. 
8. 2z2 + 1/w
9. Find the *modulus* and *argument* of each of the following:
10. 1 + i
11. -1 – i
12. 1 + 2i
13. 3 + 5i
14. Justify Euler’s formula using power series.
15. Explain how de Moivre’s theorem is a special case of Euler’s formula.
16. Express z = 1 + i in polar form, rei. What is the *modulus* of z? What is its *argument*?
17. Express each of the following in the form a + bi
18. ei
19. ii
20. (1 + i)100
21. Using de Moivre’s theorem, express sin 3 in terms of sin  and cos .
22. Using de Moivre’s theorem, express cos 5 in terms of sin  and cos .
23. Find the four fourth roots of -1.
24. Find the three cube roots of 8i.
25. Find the five fifth roots of 1.
26. Using power series, determine a relationship between cosh x and cos x and between sinh x and sin x.



 *The imaginary number is a fine and wonderful resource of the human spirit, almost an amphibian between being and not being.*

- Gottfried Wilhelm Leibniz (1646-1716)

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