

Date Completed: _____

Mentor Initials: _____

A mentor can change everything.



Complex Numbers (Advanced)

- Given that $i^2 = -1$ and that k is a positive odd integer, which of the following is a possible value of i^{6k} ?
 - $-i$
 - -1
 - 0
 - i
 - 1
- Given that $i^n = -i$, which of the following statements about n must be true?
(Note: $i^2 = -1$)
 - When n is divided by 4, the remainder is 0
 - When n is divided by 4, the remainder is 1
 - When n is divided by 4, the remainder is 2
 - When n is divided by 4, the remainder is 3
 - Cannot be determined from the given information.
- For the complex number i and an even integer x , what is a possible value of i^x ?
 - -1
 - $-i$
 - 0
 - i
 - $\sqrt{2}$
- Which of the following equations is equivalent to $16x^2 + 49$?
 - $(4x + 7)^2$
 - $(4x + 7i)^2$
 - $(4xi + 7)^2$
 - $(4x + 7)(4x - 7)$
 - $(4x + 7i)(4x - 7i)$

5. You are given the following system of equations:

$$y = x^2$$
$$px + qy = z$$

where p , q , and z are integers. For which of the following will there be two non-real solutions?

- A. $p^2 - 4qz < 0$
 - B. $q^2 - 4pz < 0$
 - C. $p^2 + 4qz > 0$
 - D. $q^2 + 4qz > 0$
 - E. $p^2 + 4qz < 0$
6. What are the solutions to $x^2 - 2x + 82 = 0$?
- A. 2 and 41
 - B. $1 \pm 2\sqrt{41}i$
 - C. $1 \pm 9i$
 - D. $1 \pm 18i$
 - E. $2 \pm 9i$
7. Which of the following quadratic equations has the complex number $-1 + 2i$ as a solution?
- A. $x^2 + 2 = 0$
 - B. $x^2 + x + 2 = 0$
 - C. $x^2 - x + 2 = 0$
 - D. $x^2 + 2x + 5 = 0$
 - E. $x^2 - 2x + 5 = 0$
8. Which of the following equations given in factored form has roots at $\frac{2}{3}$, $\frac{4}{3}$, i , and $-i$?
- A. $(3x - 2)(3x - 4)(x^2 + 1) = 0$
 - B. $(3x - 2)(3x - 4)(x^2 - 1) = 0$
 - C. $(3x + 2)(3x - 4)(x^2 + 1) = 0$
 - D. $(3x + 2)(3x - 4)(x^2 - 1) = 0$
 - E. $(3x + 2)(3x + 4)(x^2 + 1) = 0$

$$i^4 + i^5 + i^6 + i^7$$

9. The complex number expression above can be rewritten in the form $c + di$, where c and d are real numbers. What is the value of $|c| + |d|$?
- A. -4
 - B. -1
 - C. 0
 - D. 1
 - E. 4
10. In the complex number system, what is the value of the expression $20i^4 - 5i^2 + 2$?
- A. 17
 - B. $17i$
 - C. 0
 - D. 27
 - E. $27i$

$$x^4 - 32x^2 - 144 = 0 ?$$

11. What is the solution set of the above equation?
- A. $\{-12, 12\}$
 - B. $\{-12, 6, 2\}$
 - C. $\{-4, -3, 12\}$
 - D. $\{-2, 2, -6i, 6i\}$
 - E. $\{-6, 6, -2i, 2i\}$
12. For all real number x and the imaginary number i , which of the following expressions is equivalent to $(x - 2i)^3$?
- A. $x^3 - 12x^2i - 36x - 8i$
 - B. $x^3 + 12x^2i - 36x + 8i$
 - C. $x^3 + 6x^2i - 12x - 8i$
 - D. $x^3 - 6x^2i - 12x + 8i$
 - E. $x^3 + 8i$