For all questions, answer E) NOTA means none of the above answers is correct. Good luck and have fun!

1. Consider the functions and . If , find the value of
2. -3 B) -1 C) 1/3 D) 1 E) NOTA
3. A function is defined by , while another function is defined by . What is the smallest integer x in which both functions give the same value?
4. 2 B) 3 C) 4 D) 5 E) NOTA
5. What is the sum of the reciprocal of the roots of ?
6. 1 B) 2 C) 3 D) 4 E) NOTA
7. Find the domain of the function .
8. B)

C) D)

E) NOTA

1. Given the function , what value of makes true?
2. 5 B) 10 C) 15 D) 20 E) NOTA
3. Use the following table for questions 6-8. Assume that all functions are one-to-one with domains over all real numbers.

|  |  |  |  |
| --- | --- | --- | --- |
| x | f(x) | g(x) | h(x) |
| 1 | 3 | 6 | -1 |
| 2 | 10 | 4 | 5 |
| 3 | 5 | 2 | 4 |
| 4 | 2 | 1 | 2 |

Find .

1. 1 B) 2 C) 3 D) 4 E) NOTA
2. Given that , among the given values of x, which value results in the highest value of
3. 1 B) 2 C) 3 D) 4 E) NOTA
4. If , which of the following is a possible value of N?
5. 1 B) 2 C) 3 D) 4 E) NOTA
6. Suppose *f* is an even function and *g* is an odd function, both defined for all real numbers. Let . If and , find .
7. -40 B) -20 C) 20 D) 40 E) NOTA
8. Function . Function . What value of makes ?
9. -5 B) -3 C) 3 D) 5 E) NOTA
10. What is the sum of the coefficients of the terms in the expansion of
11. 1024 B) 512 C) 128 D) 42 E) NOTA
12. Suppose is a linear function passing through points (2, -5) and (-5, 2). Determine .
13. 2 B) -2 C) 6 D) -6 E) NOTA
14. Joy and Jade are practicing how to factor equations. Joy writes down the equation

 but Jade copies the equation wrong, writing . After solving the problem, Joy noticed that one of the roots they got was different. If Joy got the roots a, b, c, and Jade got the roots a, b, d, what is c+d?

A) 4 B) 6 C) 8 D) 10 E) NOTA

1. Given that for all real numbers of 𝑥 except 0, what is equal to?
2. B) C) D) E) NOTA
3. Let . Which function is equivalent to multiplied by itself?
4. C) E) NOTA

B) D)

1. Given that , which of the following is not an even nor an odd function?
2. B) C) D) E) NOTA
3. Function is a polynomial function with degree 6 and rational coefficients. It has several roots including 2 - 𝑖, 𝑖, and 1 − 𝑖. Given ) is 4, what is ?
4. 0 B) 10 C) 50 D) 100 E) NOTA
5. Define the operation as follows: Determine the value of

() (5).

1. 6 B) C) D) E) NOTA
2. Let . Which expression is equivalent to ?
3. B) C) D) E) NOTA
4. What is a possible real value of , given that  and ?
5. 2 B) 4 C) 6 D) 8 E) NOTA
6. Which of the following statements is true regarding , with and rational?

I) w could have at least one negative root

II) If w has at least one positive root, then it also has at least one non-real root

III) w could have all non-real roots

A) II only B) III only C) I & II only D) II & III only E) NOTA

1. If the complete solution to the inequality  is or , find .
2. 7.5 B) 10.5 C) 15 D) 22 E) NOTA
3. Which of the following describes the graph of ?
4. circle B) ellipse C) hyperbola D) parabola E) NOTA
5. Let = the number of circular permutations of a set with x elements, and let = the number of 2-element groups that can be formed from a set of x elements (x is a positive integer). Evaluate .
6. 12! B) 11! C) 10! D) 9! E) NOTA
7. What is as defined in question 24?
8. 15 B) 138 C) 276 D) 7140 E) NOTA
9. Find all values of such that the quadratic equation has two distinct positive real solutions.
10. B) C) D) E) NOTA
11. If and , find the horizontal asymptote of the graph

.

1. B) C) D) E) NOTA
2. Let the function A(x) represent the maximum possible area of a rectangle with perimeter x. What is A(12)?
3. 6 B) 9 C) 12 D) 24 E) NOTA
4. What is the sum of the solutions of the equation
5. -16 B) -8 C) -4 D) -2 E) NOTA
6. Let , or the function that produces the greatest integer less than or equal to the x. Find . Here denotes the composition of with itself times.
7. -2019 B) -1 C) 0 D) 1 E) NOTA