

Advanced High School Algebraic Mastery

Mathematics · Answer Key · 10 Questions

1. Which of the following describes the behavior of a polynomial function $f(x) = ax^n + \dots$ as x approaches infinity if $a < 0$ and n is an even integer?

- A) $f(x)$ approaches infinity
- B) $f(x)$ approaches negative infinity**
- C) $f(x)$ approaches 0
- D) $f(x)$ oscillates indefinitely

2. Given the system of equations $2x + y - z = 3$, $x - y + 2z = 4$, and $3x - 2z = 1$, what is the value of x ?

- A) 1
- B) 2**
- C) 3
- D) 4

3. What is the discriminant of the quadratic equation $3x^2 - 5x + 4 = 0$?

- A) -23**
- B) 7
- C) 23
- D) 49

4. According to the Remainder Theorem, what is the remainder when the polynomial $P(x) = x^3 - 2x^2 + x - 5$ is divided by $(x - 3)$?

- A) 3
- B) 7**
- C) 10
- D) 13

5. For the function $f(x) = \log_b(x)$, which condition must be satisfied for the function to be defined as a real-valued function?

- A) $x > 0$, $b > 0$, $b \neq 1$**
- B) $x \geq 0$, $b > 0$
- C) $x \neq 0$, $b > 1$
- D) $x > 0$, $b \neq 0$

6. Which expression is equivalent to the simplified form of $(i^{10} + i^{20})$ where i is the imaginary unit?

- A) 0
- B) 1
- C) $2i$
- D) -2**

7. What are the vertical asymptotes of the rational function $f(x) = \frac{x^2 - 4}{x^2 - x - 6}$?

- A) $x = 3$**
- B) $x = -2$
- C) $x = 2, x = -3$
- D) $x = 3, x = -2$

8. If $\log_2(x) + \log_2(x - 2) = 3$, what is the valid solution for x ?

- A) 4**
- B) -2
- C) 4 and -2
- D) None of these

9. What is the expansion of $(x + y)^5$ using the Binomial Theorem?

- A) $x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$**
- B) $x^5 + x^4y + x^3y^2 + x^2y^3 + xy^4 + y^5$
- C) $x^5 + 5x^4y + 5x^3y^2 + 5x^2y^3 + 5xy^4 + y^5$
- D) $x^5 + 10x^4y + 10x^3y^2 + 10x^2y^3 + 10xy^4 + y^5$

10. For a geometric series with first term $a=2$ and common ratio $r=0.5$, what is the sum to infinity?

- A) 1
- B) 2
- C) 4**
- D) 8