

# Module 2: Advanced Math

Practice Question Paper | 25 Questions | 35 Minutes

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 25

Class/Section: \_\_\_\_\_

Teacher: \_\_\_\_\_

**DIRECTIONS:** For Questions 1–23, choose the single best answer from the four choices. For Questions 24–25, solve and write your answer in the grid-in box provided. Calculators may be used.  
**TOPICS:** Quadratics · Polynomials · Exponential Functions · Equivalent Expressions · Complex Numbers · Function Notation & Transformations · Systems · Inequalities

## 01 Quadratics, Vertex & Completing the Square Q1 – Q4

- The function  $f$  is defined by  $f(x) = -3x^2 + 12x - 5$ . What are the coordinates of the vertex of the graph of  $y = f(x)$  in the  $xy$ -plane?
  - (2, -7)
  - (2, 7)
  - (-2, 7)
  - (-2, -7)
- The polynomial  $p$  is defined by  $p(x) = 2x^3 + 3x^2 - 11x - 6$ . Which of the following gives all zeros of  $p$ ?
  - 3,  $-\frac{1}{2}$ , and 2
  - 3,  $\frac{1}{2}$ , and 2
  - 2,  $\frac{1}{2}$ , and 3
  - 1, 2, and -3
- If  $25^{(x-1)} = 125^{(x/3)}$ , what is the value of  $x$ ?
  - 2
  - 0
  - 2
  - 6
- The equation  $x^2 + 10x - 3 = 0$  is rewritten in the form  $(x + 5)^2 = k$ . What is the value of  $k$ ?
  - 3
  - 22
  - 25
  - 28

## 02 Rational Equations & Extraneous Solutions Q5 – Q7

5. What is the solution to the equation below?

$$5/(x - 3) = (x + 2)/(x - 3) + 2$$

- A.  $x = 0$
  - B.  $x = 1$
  - C.  $x = 3$
  - D. There is no solution
- 

6. The system of equations below is given. At which points do the graphs of the two equations intersect?

$$y = x^2 - 3x + 2$$

$$y = 2x - 4$$

- A. (1, -2) and (3, 2)
  - B. (2, 0) and (3, 2)
  - C. (-2, 0) and (3, 2)
  - D. (1, -2) and (2, 0)
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7. The functions  $f$  and  $g$  are defined by  $f(x) = \sqrt{x + 1}$  and  $g(x) = 3x^2 - 1$ . What is the value of  $f(g(2))$ ?

- A.  $\sqrt{10}$
  - B.  $\sqrt{11}$
  - C.  $2\sqrt{3}$
  - D.  $4\sqrt{3}$
- 

### 03 Absolute Value, Discriminants & Inverse Functions Q8 – Q11

8. What is the larger of the two values of  $x$  that satisfy  $|4x - 7| = 2x + 1$ ?

- A. 1
  - B. 2
  - C. 4
  - D. 6
- 

9. The function  $f$  is defined by  $f(x) = (x - 4)^2 + 1$  for  $x \geq 4$ . What is the value of  $f^{-1}(10)$ ?

- A. 5
  - B. 7
  - C. 9
  - D. 13
- 

10. For what positive value of  $k$  does the equation  $3x^2 - kx + 12 = 0$  have exactly one real solution?

- A. 12
- B. 9
- C. 6
- D. 3

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11. The polynomial  $p$  is defined by  $p(x) = x^4 - 2x^3 + x - 5$ . What is the remainder when  $p(x)$  is divided by  $(x + 1)$ ?

- A. -7
- B. -5
- C. -1
- D. -3

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#### 04 Exponential Models, Quadratic Analysis & Radical Equations Q12 – Q14

12. A bacterial culture grows according to  $P(t) = 1,200 \cdot 2^{t/5}$ , where  $P$  is the number of bacteria and  $t$  is time in hours. After how many hours does the population first reach 9,600?

- A. 5
- B. 10
- C. 15
- D. 20

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13. The equation  $4x^2 - 8x + 3 = 0$  has two solutions. Which of the following correctly states both the sum and the product of the two solutions?

- A. Sum = 1, Product =  $\frac{3}{4}$
- B. Sum = 2, Product =  $\frac{3}{4}$
- C. Sum = 2, Product = 3
- D. Sum = 8, Product = 3

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14. Which of the following gives all values of  $x$  that satisfy  $\sqrt{5x - 4} - \sqrt{x} = 2$ ?

- A.  $x = 1$  only
- B.  $x = 1$  and  $x = 4$
- C.  $x = 4$  only
- D. There are no real solutions

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#### 05 Complex Numbers, Parabolas & Equivalent Expressions Q15 – Q18

15. Which of the following equals  $(4 + 3i) / (2 - i)$ , where  $i = \sqrt{-1}$ ?

- A.  $1 + 2i$
- B.  $1 - 2i$
- C.  $2 + i$
- D.  $2 + 2i$

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16. The function  $f$  is defined by  $f(x) = x^2 - 6x + 9$ . Which of the following best describes the  $x$ -intercept(s) of the graph of  $y = f(x)$ ?

- A. No x-intercepts
  - B. Exactly one, at  $x = 3$
  - C. Exactly two, at  $x = 3$  and  $x = -3$
  - D. Exactly two, at  $x = 1$  and  $x = 9$
- 

17. Which of the following is equivalent to  $(2x^2 + 7x + 3) / (2x + 1)$ , for  $x \neq -\frac{1}{2}$ ?
- A.  $2x + 3$
  - B.  $x + 3$
  - C.  $x + 7$
  - D.  $2x^2 + 3$
- 

18. A scientist models the amount of a substance remaining in a sample using  $A(t) = 240 \cdot (\frac{1}{2})^{(t/8)}$ , where  $A$  is the amount in grams and  $t$  is time in hours. After how many hours will exactly 30 grams of the substance remain?
- A. 16
  - B. 20
  - C. 24
  - D. 32
- 

## 06 Function Notation, Transformations & Polynomial Behavior Q19 – Q23

19. The function  $f$  is defined by  $f(x) = 3x^2 - 5$ . If  $f(k) = 22$ , where  $k$  is a positive constant, what is the value of  $k$ ?
- A. 3
  - B. 4
  - C. 5
  - D. 9
- 

20. The graph of  $f(x) = x^3$  is transformed to produce  $g(x) = (x + 2)^3 - 5$ . Compared to the graph of  $f$ , the graph of  $g$  is obtained by which of the following?
- A. A shift of 2 units left and 5 units down
  - B. A shift of 2 units right and 5 units down
  - C. A shift of 2 units left and 5 units up
  - D. A shift of 2 units right and 5 units up
- 

21. Which of the following gives all values of  $x$  that satisfy  $x^2 - 5x - 14 > 0$ ?
- A.  $-2 < x < 7$
  - B.  $x > 7$  only
  - C.  $x < -2$  or  $x > 7$
  - D.  $x < -7$  or  $x > 2$
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22. The polynomial  $p$  is defined by  $p(x) = 3x^3 - 5x^2 + 2x - 8$ . What is  $p(2)$ ?
- A. -4
  - B. 0
  - C. 4
  - D. 8
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23. The function  $h$  is defined by  $h(x) = x^4 - 16$ . Which of the following lists all real zeros of  $h$ ?
- A.  $x = 2$  only
  - B.  $x = 2$  and  $x = -2$
  - C.  $x = 2$ ,  $x = -2$ ,  $x = 2i$ , and  $x = -2i$
  - D.  $x = 4$  and  $x = -4$
- 

**07 Student-Produced Response (Grid-In) Q24 – Q25**

**DIRECTIONS:** Solve each problem below. Enter your answer in the box. Fractions, decimals, and negative values are all accepted.

24. The function  $f$  is defined by  $f(x) = 2x^2 - 16x + 35$ . What is the minimum value of  $f$ ?
- Tip: Rewrite by completing the square or use  $x = -b / 2a$  to find the vertex.

**Answer:** \_\_\_\_\_

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25. The system of equations below is given. What is the value of  $xy$ ?

$$2x + 3y = 18$$

$$x - y = 1$$

Tip: Solve for  $x$  and  $y$  first, then compute their product.

**Answer:** \_\_\_\_\_

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