

QUEENS COLLEGE  
DEPARTMENT OF MATHEMATICS

Final Examination (2 hours 30 minutes)

Math 115 Spring 2019

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

PART 1: MULTIPLE CHOICE QUESTIONS

Instructions: Answer all questions. No partial credit will be given for this section. Write the letter for the correct answer in the blank space next to each question. (2 points each.)

1. \_\_\_\_\_ If  $A = 3x^2 + 5x - 6$  and  $B = -2x^2 - 6x + 7$ , then  $A - B$  equals  
A.  $-5x^2 - 11x + 13$   
B.  $5x^2 + 11x - 13$   
C.  $-5x^2 - x + 1$   
D.  $5x^2 - x + 1$
2. \_\_\_\_\_ When  $x \neq 0$ , the expression  $x^{-8} \cdot x^4$  is equal to  
A.  $\frac{1}{x^4}$   
B.  $\frac{1}{x^{32}}$   
C.  $-x^2$   
D.  $-x^{12}$
3. \_\_\_\_\_ The system of equations  $\begin{cases} 2x + 4y = 10 \\ 2x + 4y = -10 \end{cases}$  has  
A.  $x = 3, y = 1$  as its only solution  
B.  $x = 6, y = -4$  as its only solution  
C. no solution  
D. infinitely many solutions
4. \_\_\_\_\_ An equation of the line that passes through the points  $(-3, 0.5)$  and  $(3, -0.5)$  is  
A.  $y = -\frac{1}{6}x$   
B.  $y = -6x$   
C.  $y = -\frac{1}{6}x + 1$   
D.  $y = -6x - 17.5$
5. \_\_\_\_\_ Which equation has the same solution set as  $x^2 - 6x - 12 = 0$ ?  
A.  $(x + 3)^2 = 21$   
B.  $(x - 3)^2 = 21$   
C.  $(x + 3)^2 = 3$   
D.  $(x - 3)^2 = 3$
6. \_\_\_\_\_ The  $x$ -intercept of the graph of  $4x - 5y = 40$  is  
A. 10  
B.  $\frac{4}{5}$   
C.  $-\frac{4}{5}$   
D. -8
7. \_\_\_\_\_ The  $y$ -intercept of the rational function  $y = \frac{2x + 15}{x - 3}$  is  
A. 15  
B. -5  
C. -3  
D. 12
8. \_\_\_\_\_ Which values of  $x$  will make the function  $y = \frac{x - 4}{2x^2 + 8x}$  undefined?  
A.  $x = 2$  and  $x = 8$   
B.  $x = -4$  and  $x = 8$   
C.  $x = -4$  and  $x = 4$   
D.  $x = -4$  and  $x = 0$

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9. \_\_\_\_\_ Which of the following is equivalent to  $\frac{10x^6y^3}{15x^2y^6}$  ?
- A.  $\frac{2x^3}{3y^2}$
- B.  $\frac{3x^8}{2y^9}$
- C.  $\frac{2x^4}{3y^3}$
- D.  $\frac{3x^2}{2y^3}$
10. \_\_\_\_\_ Which of the following is equivalent to the fraction  $\frac{x^2 - 9x + 18}{15x - 5x^2}$  ?
- A.  $\frac{x-3}{5x}$
- B.  $\frac{x+6}{5x}$
- C.  $\frac{6-x}{5x}$
- D.  $\frac{-x-6}{5x}$
11. \_\_\_\_\_ When  $\frac{x^2 - 25}{3x}$  is divided by  $\frac{x+5}{9x}$ , the quotient is
- A.  $\frac{x+5}{27x}$
- B.  $3x-15$
- C.  $\frac{x-20}{3}$
- D.  $9x-5$
12. \_\_\_\_\_ Which of the following is equivalent to  $\frac{1}{x-1} - \frac{1}{x}$  ?
- A.  $\frac{x}{x-1}$
- B.  $\frac{1}{x-x^2}$
- C.  $\frac{1}{x^2-x}$
- D.  $\frac{x}{x^2-1}$
13. \_\_\_\_\_ Which equation represents a line that is perpendicular to the line represented by  $2x - y = 7$ ?
- A.  $y = -\frac{1}{2}x + 6$
- B.  $y = \frac{1}{2}x + 6$
- C.  $y = -2x + 6$
- D.  $y = 2x + 6$
14. \_\_\_\_\_ The distance between the points  $P(2, -1)$  and  $Q(-5, 1)$  is
- A.  $3\sqrt{5}$
- B. 3
- C.  $\sqrt{37}$
- D.  $\sqrt{53}$
15. \_\_\_\_\_ What is an equation of a circle with its center at  $(-3, 5)$  and a radius of 4?
- A.  $(x-3)^2 + (y+5)^2 = 16$
- B.  $(x+3)^2 + (y-5)^2 = 16$
- C.  $(x-3)^2 + (y+5)^2 = 4$
- D.  $(x+3)^2 + (y-5)^2 = 4$

16. \_\_\_\_\_ What is the midpoint of the segment joined by the points L(1,8) and M(-6,1)?
- A. (4.5, -2.5)
  - B. (-3.5, 3.5)
  - C. (-2.5, 3.5)
  - D. (-2.5, 4.5)

17. \_\_\_\_\_ Which expression is equivalent to  $(3x^2)^3$ ?
- A.  $9x^5$
  - B.  $9x^6$
  - C.  $27x^5$
  - D.  $27x^6$

18. \_\_\_\_\_ If  $x = 2$  and  $y = -3$ , what is the value of  $2x^2 - 3xy - 2y^2$ ?
- A. -20
  - B. -2
  - C. 8
  - D. 16

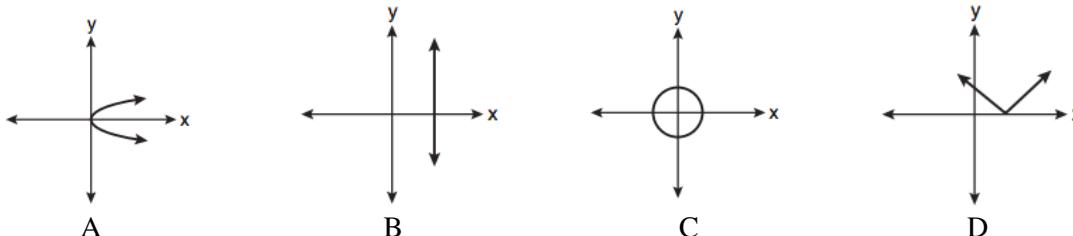
19. \_\_\_\_\_ If  $x$  is a positive integer,  $4x^{1/2}$  is equivalent to:
- A.  $\frac{2}{x}$
  - B.  $2x$
  - C.  $4\sqrt{x}$
  - D.  $\sqrt{4x}$

20. \_\_\_\_\_ The expression  $\frac{x^{1/3}}{x^{-2/3}}$  is equivalent to
- A.  $\sqrt{x}$
  - B. 1
  - C.  $x$
  - D.  $x^{-2}$

21. \_\_\_\_\_ Which expression is equivalent to  $\frac{2x^6 - 18x^4 + 2x^2}{2x^2}$  ?
- A.  $x^3 - 9x^2$
  - B.  $x^4 - 9x^2$
  - C.  $x^3 - 9x^2 + 1$
  - D.  $x^4 - 9x^2 + 1$

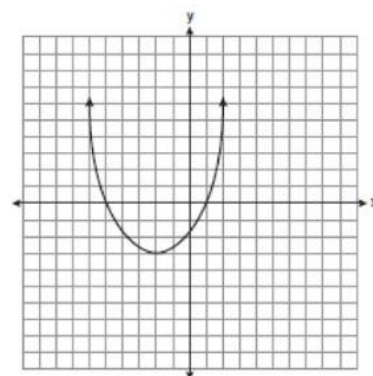
22. \_\_\_\_\_ Which equation represents a line that is parallel to the y-axis?
- A.  $x = 5$
  - B.  $x = 5y$
  - C.  $y = 5$
  - D.  $y = 5x$

23. \_\_\_\_\_ Which graph represents a function?



24. \_\_\_\_\_ At a local basketball game, all tickets are the same price and all souvenirs are the same price. Maria bought 2 tickets to the basketball game and 1 souvenir for a total of \$17.25. Mahmoud bought 5 tickets to the same game and 2 souvenirs for a total of \$42.00. How much was a ticket to this game?
- A. \$2.25
  - B. \$7.50
  - C. \$8.50
  - D. \$9.75

25. \_\_\_\_\_ What is true concerning the parabola shown at the right?
- A. The vertex has coordinates (-2, -3) and the axis of symmetry has equation  $x = -2$ .
  - B. The vertex has coordinates (-2, -3) and the axis of symmetry has equation  $y = -2$ .
  - C. The vertex has coordinates (-3, -2) and the axis of symmetry has equation  $y = -2$ .
  - D. The vertex has coordinates (-3, -2) and the axis of symmetry has equation  $x = -2$ .



**PART 2: Answer all questions in the BLUE BOOK. Answer each question on a different page. Show all the correct work for full credit. Algebraic solutions and simplifications are required. (5 points each)**

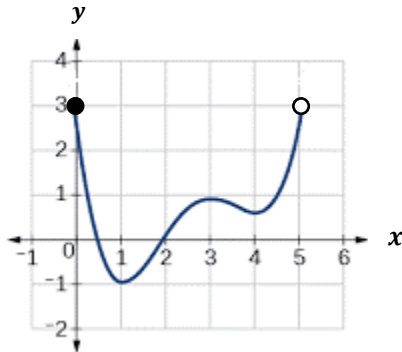
26. Find the value of  $(x + 2)^0 + (x + 1)^{-\frac{2}{3}}$  when  $x = 7$ .

27. Find all real solutions of the equation  $\sqrt{x + 3} = 3 - x$ .

28. Use algebra to find all real solutions of the equation  $x^2 = 3x$ .

29. Given that  $f(x) = x^2 - 4x + 3$ , find and simplify expressions for  $f(x) + 2$  and  $f(x + 2)$  to show that  $f(x) + 2 \neq f(x + 2)$ .

30. The graph of the function  $y = g(x)$  is shown below. Use it to answer the following questions.



- What is the domain of the function? Write your answer in interval notation.
- What is the range of the function? Write your answer in interval notation.
- For what values of  $x$  is  $g(x) = 0$ ?

31. Factor each of the following as completely as possible. If the polynomial is not factorable using integers, then write PRIME.

- $x^3 + x^2 - 4x - 4$
- $x^2 + 3x + 1$
- $x^2(x - 2) + 3x(x - 2) - 4(x - 2)$
- $2x^3y + 2xy^3$
- $3x^2 - 14x + 8$

32. Simplify the expression  $(\sqrt{x - y})^2 - (\sqrt{x} - \sqrt{y})^2$ .

33. Determine the domain of each of the following. Write your answers in interval notation.

- $y = x^2 - 5x + 6$
- $y = \frac{1}{\sqrt{x-3}}$

34. Rationalize and simplify:  $\frac{2x - 8}{\sqrt{x} + 2}$

35. Use long division to find the quotient when  $x^3 - 8$  is divided by  $x + 2$ .