For questions 1 through 25, mark your answer choice on the answer sheet provided. After completing items 1 through 25, answer each of the tiebreaker items in sequential order (do #1 first, followed by #2, and then #3 last). Be sure that your name is printed on each of the tiebreaker pages.

1. Solve the equation $\sqrt{2x + 11} - x - 4 = 0$

A) {-5, -1}   B) {-5}   C) {-1, 2}   D) {-1}   E) None of these

2. Find the domain of the function f(x) = $\frac{x-1}{x^2-5x-6}$.

A) All real numbers   B) All real numbers except 1   C) All real numbers except -1 and 6

D) All real numbers except -1,6 and 1   E) None of these

3. Find the quotient: $\frac{2+\sqrt{3}i}{\sqrt{6}i}$ (Write your answer in standard form.)

A) $-\frac{\sqrt{2}}{2} + \frac{\sqrt{6}}{3}i$ B) $\frac{1}{2} - \frac{\sqrt{6}}{3}i$ C) $\frac{\sqrt{2}}{2} - \frac{\sqrt{6}}{3}i$ D) $-\frac{1}{2} + \frac{\sqrt{6}}{3}i$ E) None of these

4. Find an equation of the line passing through the points (5,-6) and (-3,5). Write your answer in the form the Ax+By+C=0 where A, B, and C are integers with A>0.

A) 11x + 8y + 8 = 0   B) 11x + 8y − 103 = 0   C) x + 8y + 43 = 0   D) 11x + 8y − 7 = 0
E) None of these

5. Find $(f \circ g)(x)$ when $f(x) = 1 - 2x$ and $g(x) = 3x - 4$.

A) -6x − 9   B) -6x − 7   C) -6x − 1   D) -6x² + 11x − 4   E) None of these

6. Find a number k that makes the expression 4x² - 12x + k a perfect square.

A) 9   B) 36   C) 144   D) 6   E) None of these

7. If a stone is thrown directly upwards from the ground with an initial velocity of 80 feet per second, the height of the stone is s(t) = -16t²+80t. Find the maximum height of the stone before it falls back to the ground.

A) 25 ft   B) 100 ft   C) 50 ft   D) 200 ft   E) None of these

8. Simplify: $\dfrac{2(13a^{-4}b^8)}{182(a^2b^{-4})^{-1}}$

A) $\dfrac{b^4}{7a^6}$ B) $\dfrac{13b^4}{91a^2}$ C) $\dfrac{b^4}{7a^2}$ D) $\dfrac{13b^{12}}{91a^6}$ E) None of these

9. The number of shares traded per day of stock XYZ declines daily after the first day of trading. Assume the linear model   y = -2x + 102 can be used to predict the number of shares traded per day where x is the number of days after the first day and y is the number of shares traded per day in thousands. The first day of trading is July 2, 2014. When will the number of shares traded per day equal 56000?

A) July 25, 2014   B) July 24, 2014   C) July 26, 2014   D) July 23, 2014
E) None of these

10. Find a point (x,y) in quadrant II that is on the line 3x + y = 0 **and** on the circle x² + y² = 10.

A) (-1/3, 1)   B) (-3,1)   C) (1,-3)   D) (1,3)   E) None of these

11. Given two functions f and g where f(x) = 4x²-9 and g(x) = 2x-3, find the domain of the quotient f/g.

 A) All real numbers   B) All real numbers except 3   C) All real numbers except 3/2
D) All real numbers except 3/2 and -3/2   E) None of these

12. Solve the equation 111x + 40 = -77x². What is the larger solution?

A) -0.71   B) -0.73   C) -8/11   D) -5/7   E) None of these

13. For all C, $\left(\sqrt{3}\,C\right)^3$ = ?

A) $9C^3$ B) $3\sqrt{3}C^3$ C) $\sqrt{3}C^3$ D) $\sqrt[3]{3}C^3$ E) None of these

14. Assume x is a number whose distance from 3 is half as much as its distance from 0. Find all solutions for x.

A) {6}   B) {2}   C) {2, 6}   D) {3/2}   D) None of these

15. Calculate the discriminant for the quadratic equation $x^2 - 4x + 7 = 0$ and indicate the number of real solutions.

A) -12 with no real solutions   B) 12 with two real solutions

C) -2 with no real solutions   D) 2 with two real solutions   E) None of these

16. Suppose f(x) = $\begin{cases} x & ,x \leq 1 \\ x^2 & ,x > 1 \end{cases}$. Find x such that f(x) = 4.

A) {4}   B) {2,4}   C) {2}   D) {-2,4}   E) None of these

17. Find the remainder when $x^3 - 5x^2 + 24x + 14$ is divided by x + 3.

A) 68   B) -130   C) -76   D) 14   E) None of these

18. Which of the following describes the transformations needed to obtain $f(x) = \sqrt{-x} + 1$ from the parent function $f(x) = \sqrt{x}$.

A) Reflect across the x-axis and shift right 1 unit   B) Reflect across the y-axis and shift left 1 unit
C) Reflect across the x-axis and shift up 1 unit   D) Reflect across the y-axis and shift up 1 unit
E) None of these

19. What is the third term in the polynomial expansion of $(x + 2)^4$?

A) $24x^2$ B) $16x^2$ C) $8x^2$ D) $4x^2$ E) None of these

20. Find the trinomial factor for $8x^3-27y^3$.

A) $8x^2+12xy-9y^2$ B) $4x^2+6xy+9y^2$ C) $4x^2+6xy-9y^2$ D) $4x^2+12xy+9y^2$
E) None of these

21. Find the vertical asymptote(s) for the graph of $y=\text{Log}_2 x + \text{Log}_2(x-1)$.

A) x=0   B) x=0, x=1   C) x=1   D) x=2   E) None of these

22. Suppose A = $\begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$, find A^{-1}.

A) $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & \frac{1}{2} \\ 1 & -1 \end{bmatrix}$ C) $\begin{bmatrix} 1 & \frac{1}{2} \\ 0 & -1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$ E) None of these

23. Suppose f(x) = $\frac{x+3}{2}$, find $f^{-1}(x)$.

A) $f^{-1}(x) = 2x - 3$ B) $f^{-1}(x) = \frac{x-3}{2}$ C) $f^{-1}(x) = 2(x-3)$ D) $f^{-1}(x) = \frac{x+2}{3}$

E) None of these

24. Solve the system of equations $\begin{array}{l} 8x+12y=36 \\ 10x+15y=35 \end{array}$.

A) $(1,\frac{7}{3})$ B) (-3,5)   C) (1,2)   D) No Solution   E) None of these

25. Suppose that $7500 is invested in an account that pays 3% compounded continuously. Find the amount in the account after 5 years.

A) $8195.45   B) $8713.76   C) $8694.56   D) $8734.56   E) None of these

Name_____

Tie Breaker #1

Two teachers are grading math homework. One teacher can grade a stack of papers in 75 minutes and the other can complete the job in 90 minutes. How long does it take them to grade all the papers if the first teacher grades alone for 20 minutes, then they work together to finish?

Name_____

Tie Breaker #2

Find an equation of the parabola with vertex (-1,-4) that passes through the point (1, 16). Write your answer in the form $y = ax^2+bx+c$.

Name_____

Tie Breaker #3

Solve the inequality $|2x+1| \geq |x-5|$. Find an algebraic solution that does not require the use of a calculator.

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ANSWER KEY

1. D	Solution: Tie Breaker #1
2. C	The rate for teacher one is 1/75 and the rate for teacher two is 1/90.
3. C	Teacher one works alone for 20 minutes. Hence, 20(1/75) of the job is complete.
4. D	Let t be the time the teacher's grade together.
5. E	The equation that shows the completed job is:
6. A	20(1/75) + t(1/75) + t(1/90) = 1
7. B	Multiply by the LCD of 450.
8. C	450[20(1/75) + t(1/75) + t(1/90)] = (1)450
9. A	120 + 6t + 5t = 450
10. E	t=30
11. C	Therefore, the total time is 20+30=50 minutes.
12. D	
13. B	
14. C	Solution: Tie Breaker #2
15. A	$Y=a(x-h)^2+k$
16. C	$16=a(1-(-1))^2+(-4)$
17. B	16=4a-4
18. D	20=4a
19. A	5=a
20. B	
21. C	$Y=5(x+1)^2-4$
22. D	$Y=5x^2+10x+5-4$
23. A	$Y=5x^2+10x+1$

24. D 25. B	Solution: Tie Breaker #3 Solve the equation $\|2x+1\|=\|x-5\|$ 2x+1=x-5 or 2x+1=-(x-5) X=-6 or x = 4/3 Possible solutions are $(-\infty, -6], \left[-6, \frac{4}{3}\right], \left[\frac{4}{3}, \infty\right)$ Test each interval $(-\infty, -6]$: choose x=-7, $\|2(-7)+1\| \geq \|(-7)-5\|$ or 13≥12 "True" $\left[-6, \frac{4}{3}\right]$: choose x=0 , $\|2(0)+1\| \geq \|(0)-5\|$ or 1≥5 "False" $\left[\frac{4}{3}, \infty\right)$: Choose x=2, $\|2(2)+1\| \geq \|(2)-5\|$ or 5≥3 "True" The solution is $(-\infty, -6] \cup \left[\frac{4}{3}, \infty\right)$.