

# Algebra II March Regional 2000

NOTA means "none of the above" answers is correct.

1. Simplify:  $\frac{x^{k-2}y^{2k}}{x^{k+1}(y^{k-1})^2}$   
 A  $y^2x^{-3}$     B  $x^{-1}y^{-2}$     C  $y^{4k+2}x^{2k-1}$     D  $xy^2$     E NOTA
  
2. Give the equations of the asymptotes of the hyperbola  $y^2 = 4x^2 + 16$   
 A  $y = \pm 2x$     B  $y = \pm \frac{1}{2}x$     C  $y = \pm 4x$     D  $y = \pm \frac{1}{4}x$
  
3. An infinite geometric series has the sum  $\frac{5+3\sqrt{3}}{2}$ . The first term is  $2+\sqrt{3}$ .  
 Find the common ratio.  
 A  $-1+\sqrt{3}$     B  $-2$     C  $5-3\sqrt{3}$     D  $2-\sqrt{3}$     E NOTA
  
4. Simplify where  $i = \sqrt{-1}$ .  $6i^3 - 5i^5 - 3i^2$   
 A  $-3-i$     B  $3-11i$     C  $3-i$     D  $-3+11i$     E. NOTA
  
5. Solve for  $x$  and  $y$  in terms of  $a$  and  $b$ .  $\frac{2}{x} + \frac{3}{y} = 5a + b$  and  $\frac{1}{y} - \frac{4}{x} = 5b - 3a$ .  
 A.  $\left(\frac{1}{a-b}, \frac{1}{a+b}\right)$     B.  $\left(\frac{7}{13}a, -\frac{7}{3}b\right)$     C.  $\left(\frac{13}{7}a - \frac{3}{7}b\right)$     D.  $(a+b, a-b)$     E. NOTA
  
6. Which of the following is an equation of a parabola with focus  $\left(-4, -\frac{3}{2}\right)$  and vertex  $(-4, -3)$ ?  
 A.  $y^2 + 8y - 6x + 28 = 0$     B.  $x^2 + 6x - 4y + 13 = 0$     C.  $x^2 + 8x - 6y - 2 = 0$   
 D.  $y^2 + 6y - 4x + 17 = 0$     E. NOTA
  
7. Given  $x > 0$ ,  $y > 0$ ,  $x > y$  and  $z \neq 0$ . The inequality which is not always correct is  
 A.  $x+z > y+z$     B.  $x-z > y-z$     C.  $xz > yz$     D.  $\frac{x}{z^2} > \frac{y}{z^2}$     E. NOTA
  
8. The value(s) of  $a$  in the equation  $\log(a^2 - 15a) = 2$  are  
 A.  $\frac{15 \pm \sqrt{233}}{2}$     B.  $20, -5$     C.  $\frac{15 \pm \sqrt{305}}{2}$     D.  $\pm 20$     E. NOTA

9. Michelle takes three minutes less than Lauren to deliver a box of candygrams. On delivery day, Michelle started delivering alone and spent six minutes in delivering her box of candygrams when she was called back to class. Lauren took Michelle's box and finished the delivery in four minutes. How many minutes would it take Michelle alone to deliver a box of candygrams?  
A. 12      B. 9      C. 4      D. 1      E. NOTA
10. The sum of the roots of  $3 \cdot 3^{7x} = \frac{3^{7x}}{3^{11}}$  is  
A. -7      B. -1      C. 1      D. 7      E. NOTA
11. The sum of the factors of  $x^3 - x^2 - 8x + 12$  is  
A.  $3x+8$       B.  $3x-6$       C.  $3x+3$       D.  $3x-1$       E. NOTA
12. Rationalize the denominator and simplify:  $\frac{1}{\sqrt{5} + \sqrt{6} + \sqrt{11}}$   
A.  $\frac{\sqrt{5} + \sqrt{6} - \sqrt{11}}{30}$       B.  $\frac{5\sqrt{6} + 6\sqrt{5} - \sqrt{330}}{60}$       C.  $\frac{-\sqrt{5} + \sqrt{6} + \sqrt{11}}{12}$       D.  $\frac{\sqrt{5} - \sqrt{6} - \sqrt{11}}{60}$       E. NOTA
13. The sum of the solutions for  $\sqrt{3x+1} - \sqrt{x-4} = 3$  is  
A. 5      B. 10      C. 12      D. 13      E. NOTA
14. Which of the following is equivalent to  $\frac{3+2i}{3+4i}$ ?  
A.  $\frac{1}{25} - \frac{6}{25}i$       B.  $\frac{1}{25} - \frac{18}{25}i$       C.  $\frac{17}{25} + \frac{18}{25}i$       D.  $\frac{17}{25} + \frac{6}{25}i$       E. NOTA
15. If the roots of the equation  $y^2 - 5y + P = 0$  are equal, what is the sum of one of the roots and  $P$ ?  
A. 0      B. 20      C.  $\frac{35}{4}$       D.  $\frac{5}{2}$       E. NOTA
16. Solve  $\left(\frac{1}{x} - 2\right)^2 - 6\left(\frac{1}{x} - 2\right) + 5 = 0$ .  
A.  $\left\{\frac{1}{3}, \frac{1}{7}\right\}$       B.  $\left\{\frac{1}{3}, -1\right\}$       C.  $\left\{\frac{1}{3}, 1\right\}$       D.  $\left\{\frac{1}{5}, 1\right\}$       E. NOTA
17. Copper alloy K is 20% pure copper. Copper alloy T is 15% pure copper. What ratio (alloyK:alloyT) must be melted together to produce 30 kg of alloy containing 5 kg of copper?  
A. 5:3      B. 3:5      C. 2:1      D. 1:2      E. NOTA

18. The equation  $y + \sqrt{y-4} = 6$  has  
 A. 2 real roots      B. only one real root      C. one real and one imaginary root  
 D. only one imaginary root      E. NOTA
19. If two geometric means were inserted between 128 and  $-2$ , their sum could be  
 A.  $-24$       B.  $-12$       C.  $12$       D.  $24$       E. NOTA
20.  $7^y = 840$  can be expressed as  $y =$   
 A.  $1 + \log_7 120$       B.  $1 + \log_{10} 7 + \log_7 12$       C.  $1 + \log_{10} 7$       D.  $120$       E. NOTA
21. If  $2^{\log_2 x} = 5$  and  $3^{\log_3 y} = 10$ , then  $x - y =$   
 A.  $-7$       B.  $-5$       C.  $-\frac{5}{6}$       D.  $0.5$       E. NOTA
22. If a circle passes through the points  $(0,1)$ ,  $(0,3)$ , and  $(2,5)$ , the coordinates of the center are  
 A.  $(0,2)$       B.  $(1,4)$       C.  $(3,2)$       D.  $(\frac{2}{3}, 2)$       E. NOTA
23. If  $f(x) = -3x + 2$  and  $g(x) = x^2 - 1$ , then what is the coefficient of the  $x^2$  term of  $f(g(x))$ ?  
 A.  $-3$       B.  $0$       C.  $1$       D.  $2$       E. NOTA
24. For what real numbers,  $x$ , is  $3^x < 0$ ?  
 A. all  $x < 1$       B. all  $x < 0$       C. all  $x > 0$       D. no  $x$       E. NOTA
25. If  $f$  and  $g$  are inverse functions and if  $(2, -3)$  is a point on the graph of  $y = g(x)$ , which of the following could define  $f$ ?  
 A.  $f(x) = 2x + 8$       B.  $f(x) = x^2 - 1$       C.  $f(x) = x - 5$       D.  $f(x) = 4x - 11$       E. NOTA
26. If  $\log 2 = a$  and  $\log 3 = b$ , then  $\log 60 =$   
 A.  $a + b + 1$       B.  $10ab$       C.  $10(a + b)$       D.  $5a^2b$       E. NOTA
27. Find the value of  $|5 - 12i|$  where  $i = \sqrt{-1}$ .  
 A.  $-13$       B.  $-\sqrt{119}$       C.  $\sqrt{119}$       D.  $13$       E. NOTA

28. If  $f(a) = 2 - a$  and  $F(a, b) = b^2 + a$ , then  $F[3, f(4)]$  is  
A.  $a^2 - 4a + 7$       B. 28      C. 8      D. 7      E. NOTA

29. Perform the following operation. Express your answer in simplified form.

$$\left( \frac{x^2 + 2x - 8}{2x^2 + 7x + 6} \div \frac{2x^2 + x - 15}{4x^2 - 4x - 15} \right) \cdot \left( \frac{x^2 - x - 12}{x^2 - 16} \right)$$

- A.  $\frac{x-2}{x+2}$       B. 1      C. -1      D.  $\frac{2x+3}{x-1}$       E. NOTA
30. Solve the following system, then find the sum of the largest value for  $m$  and the largest value for  $n$ .

$$m^2 + 3n^2 - 28 = 0$$

$$m^2 - mn + 4n^2 = 40$$

- A. 4      B. 5      C. 7      D. 8      E. NOTA