



Louisiana Mu Alpha Theta

affiliated with
Mu Alpha Theta
National High School and Junior College
Honorary Mathematics Club

50th State Convention March 25-27, 2010 Baton Rouge, Louisiana

Open - Functions

TEST RULES

1. Do not begin test until you are told to do so.
2. You must supply your own #2 pencil.
3. Only ACT approved calculators are allowed on all tests.
4. Print your name and school in the name blank, your code in the date blank, and the area test in the subject blank on your Scantron answer sheet
5. Standard procedure for machine graded papers must be followed. Use only a #2 pencil, marking the appropriate spaces carefully.
6. In case of a tie, winners will be determined according to the order in which the answer sheet was turned into the moderator.
7. Do all scratch work on your test.

Mu Alpha Theta 2010
Functions – Area Test

(NOTA stands for “none of the above”)

1. The domain of the function defined by $f(x) = \sqrt{8 - 2x}$ is:
A. $x < 4$ B. $x > 4$ C. $x \leq 4$ D. $x \geq 4$ E. NOTA
2. If $f(x) = 4x - 1$ and $g(x) = -x^2 + 2x$, then $(g \circ f)(x)$ equals:
A. $-16x^2 - 1$ B. $-16x^2 + 16x - 3$ C. $-16x^2 - 3$ D. $-16x^2 - 16x + 3$ E. NOTA
3. The range of the function defined by $g(x) = \frac{2 + x}{3x - 2}$ is:
A. $y \neq 1$ B. $y \neq \frac{2}{3}$ C. $y \neq -2$ D. $y \neq -1$ E. NOTA
4. If $f(x) = x^2 + 3x - 4$, then $f(3) + f(2) =$
A. 6 B. 11 C. 14 D. 20 E. NOTA
5. If $g(x) = 1 - x^2$ and $f(g(x)) = \frac{1 - x^2}{x^2}$ when $x \neq 0$, then $f\left(\frac{1}{2}\right)$ equals:
A. $\frac{1}{2}$ B. $\frac{3}{4}$ C. 1 D. $\sqrt{2}$ E. NOTA
6. For each real number x , let $f(x)$ be the minimum of the numbers $4x + 1$, $x + 2$, and $-2x + 4$. Then the maximum value of $f(x)$ is :
A. $\frac{1}{3}$ B. $\frac{1}{2}$ C. $\frac{2}{3}$ D. $\frac{5}{2}$ E. NOTA
7. Let $f(x) = ax^7 + bx^3 + cx - 5$, where a , b , and c are constants. If $f(-7) = 7$, then $f(7) =$
A. -17 B. -7 C. 14 D. 21 E. NOTA
8. If in applying the quadratic formula to a quadratic equation $f(x) = ax^2 + bx + c = 0$, it happens that $c = \frac{b^2}{4a}$, then the graph of $y = f(x)$ will certainly:
A. have a maximum B. have a minimum C. be tangent to the x-axis
D. be tangent to the y-axis E. NOTA
9. If $h(x) = [x]$ is the greatest integer function, find $h(-5.23)$.
A. -5 B. -6 C. 5 D. 6 E. NOTA

FUNCTIONS - 2010

10. $f(x) = 2x^3 - 4x^2 + 7x + 1$, find the sum of the zeros of $h(x) = f(2x - 3)$.
 A. $\frac{9}{2}$ B. $\frac{11}{2}$ C. $\frac{7}{2}$ D. $\frac{13}{2}$ E. NOTA
11. If $f(x + 1) = x^2 + 2x + 3$, then $f(x) =$
 A. $x^2 + 2$ B. $x^2 - 2$ C. $x^2 + 4x - 2$ D. $x^2 + 4x + 2$ E. NOTA
12. If $f(x) = \ln x$ and $g(x) = e^x$, then $f[g(9)] =$
 A. 0 B. 3 C. 9 D. 81 E. NOTA
13. Given $f(x)$, then $f(x + 4)$ shifts
 A. 4 right B. 4 left C. 4 up D. 4 down E. NOTA
14. What is the minimum value of the function $f(x) = 2x^2 - 20x + 17$?
 A. -33 B. -5 C. 5 D. 33 E. NOTA
15. If $(f * g)(x)$ is defined by $f(g(f(x)))$, then find $(g * f)(3)$ for $f(x) = x^2 - 1$ and $g(x) = 3x$.
 A. -3 B. 240 C. 575 D. 576 E. NOTA
16. $\log \frac{1}{2} + \log \frac{2}{3} + \log \frac{3}{4} + \log \frac{4}{5} + \dots + \log \frac{99}{100} =$
 A. $\frac{1}{2}$ B. $-\frac{1}{2}$ C. 2 D. -2 E. NOTA
17. Given that $\ln 3 = a$, $\ln 5 = b$, then solve for x if $5^x = 3^{2x+1}$
 A. $\frac{2b}{a}$ B. $\frac{a}{2b}$ C. $\frac{a}{b-2a}$ D. $\frac{b}{a-2b}$ E. NOTA
18. Find the zeros of $f(x) = 2x^2 + 4x + 8$.
 A. 0, 1 B. 0, -1 C. $-1 \pm i\sqrt{3}$ D. $1 \pm i\sqrt{3}$ E. NOTA
19. Let $f(x) = \frac{x+2}{x^2-9}$, then where are the vertical asymptotes?
 A. $x = -2$ B. $y = -2$ C. $x = \pm 3$ D. $y = \pm 2$ E. NOTA
20. Given: $f(x) = 4x + 3$, find $f^{-1}(3)$.
 A. 0 B. $\frac{1}{15}$ C. 15 D. $\frac{3}{2}$ E. NOTA

FUNCTIONS 2010

21. If $f(x) = \sqrt{(x-1)^2} + \sqrt[3]{(x-3)^3}$, for what value of x , if any, does $f(x) = -1$?
- A. $-\frac{1}{2}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. $\frac{7}{4}$ E. NOTA
22. Solve for x if $\log_{10}(x-3) + \log_{10}(x-2) = \log_{10}(x+1)$
- A. $-1, -5$ B. $-1, 5$ C. $-5, 1$ D. $1, 5$ E. NOTA
23. If $f(x) = 2x + 1$ and $g(x) = 3x - 2$, for what real x is $f(x) > g(x)$?
- A. $x > -3$ B. $x < -3$ C. $x < 3$ D. $x > 3$ E. NOTA
24. If $f(x) = x^2 - 3x$, find the sum of all x such that $f(f(x)) = 2f(x) - 6$.
- A. 0 B. 2 C. 4 D. 6 E. NOTA
25. If $f(x) = x^3 - x^2 + x - 2$, then find the remainder when $f(x)$ is divided by $x + 1$.
- A. -2 B. -3 C. -4 D. -5 E. NOTA