

**ALGEBRA 2 INDIVIDUAL TEST****REGIONAL 1999**

1. If  $f(x) = 1 + \frac{1}{x}$ , find  $f(f(f(x)))$ .

a)  $\frac{2x+1}{x+1}$

b)  $\frac{3x+2}{2x+1}$

c)  $\frac{x+1}{x}$

d)  $\frac{x+1}{3x+2}$

e) NOTA

2. If  $f(x) = 3x^2 + 6x + 1$ , what is the minimum value taken on by the function  $g(x) = f(3-x)$ ?

a) -2

b) 0

c) 4

d) 8

e) NOTA

3. What is the sum of the first 80 positive odd integers subtracted from the first 80 positive even integers?

a) 20

b) 40

c) 80

d) 100

e) NOTA

4. The points (1,1), (9,1), (9,5), (5,2), (2,6) and (0,4) are connected in order with the last point connected to the first, forming a polygonal region. What is the area of this region?

a)  $25\frac{1}{2}$

b) 32

c)  $44\frac{1}{4}$

d) 64

e) NOTA

5. If cats consider one rat worth 3 mice, a squirrel worth as much as one rat and one mouse, and five chipmunks worth 3 rats, how many chipmunks would a cat "pay" for 97 mice and 32 squirrels?

a) 102

b) 125

c) 129

d) 134

e) NOTA

6. If  $(\log_3 x)(\log_x 2x)(\log_{2x} y) = \log_x x^2$ , find  $y$ .

a) 2

b) 3

c) 4

d) 9

e) NOTA

7. If  $ax^2 + bx$  are the first 2 terms of a perfect trinomial square, what is the third term?
- a)  $\frac{b}{2a}$       b)  $\frac{b^2}{2a}$       c)  $\frac{b}{4a}$       d)  $\frac{b^2}{4a}$       e) NOTA
8. A club found that it could achieve a membership ratio of 2 adults for each minor either by inducting 24 adults or expelling  $x$  minors. Find  $x$ .
- a) 12      b) 24      c) 36      d) 48      e) NOTA
9. A merchant bought some oranges at the rate of 3 for 16 cents. He bought twice as many oranges at the rate of 4 for 21 cents. To make a profit of 20%, he sold them all at the rate of 3 for  $k$  cents. Find  $k$ .
- a) 19      b) 21      c) 24      d) 25      e) NOTA
10. If  $\log_{10} 3 = a$  and  $\log_{10} 7 = b$ , find the value of  $\log_7 9$  in terms of  $a$  and  $b$ .
- a)  $\frac{2b}{a}$       b)  $2b - a$       c)  $\frac{2a}{b}$       d)  $2a - b$       e) NOTA
11. Which of the following are true? I)  $\overline{x+3i} = x-3i$   
 (Assume  $i = \sqrt{-1}$ ) II)  $\overline{iz} = -i\overline{z}$   
 III)  $(2+i)^2 = \overline{3-4i}$
- a) I, II only      b) II, III only      c) All true      d) None true      e) NOTA
12. Jack and Jill went up the hill at the rate of 8 units/min. They came tumbling down at the rate of 8 units/sec. What was their average rate, in units/min., for the round trip?
- a)  $\frac{61}{8}$       b)  $\frac{960}{61}$       c)  $\frac{1024}{81}$       d)  $\frac{1078}{81}$       e) NOTA

13. Which of the following statements is not true for the equation  $ix^2 - x + 2i = 0$ , if  $i = \sqrt{-1}$ ?

- a) The sum of the roots is 2.                      b) The discriminant is 9.  
c) The roots are imaginary.                      d) The roots are complex numbers.  
e) NOTA

14. Find all  $x$  such that  $9^{x-1} - 3^{x-1} - 2 = 0$ .

- a) No soln.                      b)  $\log_3 6$                       c)  $\log_6 3$                       d)  $\log_9 6$                       e) NOTA

15. Solve for  $x$ :  $\frac{1}{x} + x \leq -2$ .

- a)  $x < -1$                       b)  $-1 < x < 1$                       c)  $x < 1$                       d)  $x < 0$                       e) NOTA

16. Find the sum of the infinite series  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \frac{1}{64} - \frac{1}{128} + \dots$

- a) 1                      b)  $e$                       c)  $\pi$                       d) 4                      e) NOTA

17. If fence posts are 2 feet apart, how many posts are needed to enclose a rectangular field which has length 20 feet and width 12 feet?

- a) 32                      b) 34                      c) 36                      d) 40                      e) NOTA

18. A parabolic arch has a span of 24 feet. Its height is 18 feet at a point 8 feet from the center of the span. What is the height of the arch (in feet)?

- a) 27                      b) 30.5                      c) 32.4                      d) 36                      e) NOTA

19. If  $f(x) = x^2 + x - 1$  for  $x \geq -2$  and  $g(x) = x^2 - x$  for  $x < 5$ , find the domain of  $g \circ f$ .
- a)  $-3 < x < 2$       b)  $-3 \leq x < 2$       c)  $-2 < x < 2$   
d)  $-2 \leq x < 2$       e) NOTA
20. Given  $f(1-x) + (1-x)f(x) = 5$ , find  $f(5)$ .
- a) -20      b) -21      c) 20      d) 21      e) NOTA
21. A bug starts at a point  $(x, y)$  on the graph of  $4x^2 + 9y^2 = 36$ . It walks in a straight line to the point  $(-\sqrt{5}, 0)$ , then in a straight line to  $(\sqrt{5}, 0)$ , then in a straight line to its original starting point. How far has the bug walked?
- a)  $6 + 2\sqrt{5}$       b)  $8 + 2\sqrt{5}$       c)  $10 + 2\sqrt{5}$       d)  $12 + 2\sqrt{5}$       e) NOTA
22. Given a geometric sequence with the first term and common ratio both not 0, and an arithmetic sequence with the first term 0, a third sequence  $1, 1, 2, \dots$  is formed by adding the corresponding terms of the 2 given sequences. Find the sum of the first 10 terms of the third sequence.
- a) 824      b) 978      c) 1023      d) 1155      e) NOTA
23. Find  $x^4 + \frac{1}{x^4}$  if  $x - \frac{1}{x} = 5$ .
- a) 731      b) 729      c) 727      d) 725      e) NOTA

