



5) Segment A and Line B are both on the  $xy$ -plane. Line A is the line segment drawn from  $(2, -13)$  to  $(7, 0)$ . Line B contains the midpoint of Segment A, and is also perpendicular to Segment A. Find the equation of Line B.

- a.  $13x - 5y = 91$                       b.  $13x - 5y = -62$                       c.  $5x + 13y = 91$   
d.  $5x + 13y = -62$                       e. NOTA

6) If  $g(x) = 4\ln x + 1$ , the value of  $g^{-1}(\ln 81 + 1)$  is closest to which of the following?

- a. 11    b. 6    c. 1  
d. -4    e. NOTA

7) Find the decimal representation of  $11111011000_2$ . Sum the digits of this result (in base 10, of course). Square the result, and find which of the following is closest to it:

- a. 34    b. 68    c. 182  
d. 6200    e. NOTA

8) Through which quadrant does the graph of  $7x - 2y = 28$  not pass?

- a. I    b. II    c. III  
d. IV    e. NOTA

9) What is the sum of the integral solutions to  $|x - 3| - 4 \geq 0$ .

- a. 27    b. -27    c. -21  
d. Infinite Sum    e. NOTA

10) Given that  $\frac{6x}{(x+4)^2} = \frac{A}{x+4} + \frac{B}{(x+4)^2}$ , what is the value of  $A - B$ ?

- a. -18    b. -30    c. 30  
d. 18    e. NOTA

11) Who first used the letter  $e$  to denote the base of the natural logarithm function?

- a. Leonhard Euler                      b. Albert Einstein                      c. Eratosthenes  
d. Euclid of Alexandria                      e. NOTA

12) If the remainder of the following quotient:

$$\frac{x^{100} - x^{99} + x^{98} - x^{97} + \dots + x^2 - x + 1}{x + 1}$$

is written as  $\frac{A}{x+1}$ , then find the value of  $A$ .

- a. 1                                      b. -1                                      c. -101  
d. 101                                      e. NOTA

13) My four favorite numbers are unique natural numbers (I hear you breathe a sigh of relief - but don't be fooled, this question is anything but natural). If you add them all and divide by the sum of the lowest two, you'll get 3.75. The largest one is equal to the sum of the second and third largest. You'll find they're all under 10, and only the second largest is divisible by two. Which of these numbers is closest to the product of my numbers?

- a. 70                                      b. 80                                      c. 90  
d. 100                                      e. NOTA

14) My three least favorite numbers are consecutive integers. The sum of the squares of these numbers minus their sum is 20. Most of the numbers are odd. Which is closest to their product?

- a. -10                                      b. -4                                      c. 0  
d. 5                                      e. NOTA

15) My favorite hyperbola has the equation  $\frac{x^2}{e^\pi} - \frac{y^2}{\pi^e} = 1$ . What is the sum of the slopes of the asymptotes of this hyperbola?

- a.  $e^\pi - \pi^e$                                       b.  $\pi^e - e^\pi$                                       c.  $e^\pi + \pi^e$   
d. 1                                      e. NOTA

16) Let  $f(x) = Ax^2 + Bx + C$ . The discriminant of  $f(x)$  is 49, and the product of the roots of  $f(x)$  is twice the sum of the roots of  $f(x)$ . Determine the value of  $A$  in terms of  $B$ .

- a.  $\frac{B^2 - 49}{8B}$                                       b.  $\frac{B^2 - 49}{8}$                                       c.  $\frac{B^2 - 7}{8}$   
d. Cannot be determined      e. NOTA

17) Which expression is equivalent to  $\frac{xy^2z + x^{-2}y}{y^{-1}z^3}$  for  $xy \neq 0$ ?

a.  $\frac{y^2(x^3yz + 1)}{x^2z^3}$

b.  $\frac{xy^2z(y - z)}{y^2 - z}$

c.  $\frac{y^2(x^3z + y)}{xz^3 - 1}$

d.  $\frac{x^3y}{x^2z + 1}$

e. NOTA

18)  $M = \begin{vmatrix} x & 2 \\ 2x + 4 & 2x - 4 \end{vmatrix}$ . If the determinant of  $M$  is equal to the smallest prime number, in which of the following intervals do the possible values of  $x$  fall?

a.  $[-3, 2]$

b.  $[-2, 3]$

c.  $[-1, 4]$

d.  $[0, 5]$

e. NOTA

19) Given that  $\sqrt{x + \sqrt{x + \sqrt{x + \dots}}} = n$  and  $4n = 28 - x$ , which of the following is closest to the value of  $\frac{n}{x}$ , if  $n$  and  $x$  are real numbers?

a. 1

b.  $\frac{1}{2}$

c.  $\frac{1}{4}$

d.  $\frac{1}{6}$

e. NOTA

20) If the center of the circle that passes through the points  $(-3, 1)$ ,  $(4, 0)$ , and  $(6, 4)$  is  $(h, k)$ , the value of  $h + k$  is closest to which of the following?

a. 6

b. 2

c. -2

d. -6

e. NOTA

21) Given  $f(x) = \frac{x + 3}{x^2 - 1}$  and  $g(x) = \frac{1}{\sqrt{x} - 1}$ . What is the product of the whole numbers that are excluded from the domain of  $(f \circ g)(x)$ ?

a. 0

b. 1

c. 2

d. 4

e. NOTA



26) If  $\log(\sqrt[3]{25}) = A$  and  $\log\left(\frac{1}{49}\right) = B$ , what is the value of  $\log(5\sqrt{35})$  in terms of  $A$  and  $B$ ?

a.  $\frac{3A - B}{2}$

b.  $\frac{9A + B}{4}$

c.  $\frac{9A - B}{4}$

d.  $\frac{3A + B}{2}$

e. NOTA

27) What is the sum of the real solutions of the following equation:  
 $2x\sqrt{x} - 20\sqrt{x} - 6x = 0$ ?

a. 3

b. 5

c. 25

d. 29

e. NOTA

28) The maximum  $y$ -value of an ellipse occurs at  $(3,4)$ , the minimum  $y$ -value of the same ellipse occurs at  $(3,-8)$ , and the length of the semi-major axis is 10. The distance between the foci of this ellipse is closest to which of the following?

a. 5

b. 10

c. 15

d. 20

e. NOTA

29) Given that  $f(x) = 2 - x - i$  and  $g(x) = 2 - (4 - x)i$  where  $i = \sqrt{-1}$ . Find

which is closest to the value of  $\left|\frac{f(1)}{g(1)}\right| \cdot \sqrt{5 \cdot f(-i) + 3}$ ?

a.  $-2\sqrt{2}$

b.  $2\sqrt{2}$

c.  $-3\sqrt{2}$

d.  $3\sqrt{2}$

e. NOTA

30) Okay, here's an easy one. How many digits are to the left of the decimal point in  $\sqrt[3]{2008}$ ?

a. 1

b. 2

c. 3

d. 4

e. NOTA