2021 March 18 Shift 1

EE24BTECH11005 - Arjun Pavanje

16) If the functions are defined as $f(x) = \sqrt{x}$ and $g(x) = \sqrt{1-x}$, then what is the common domain of the following functions:
$f+g, f-g, \frac{f}{g}, \frac{g}{f}, g-f$ where $(f \pm g)(x) = f(x) \pm g(x), \left(\frac{f}{g}\right) = \frac{f(x)}{g(x)}$

a) $0 \le x \le 1$

b) $0 \le x < 1$

c) $0 < x < 1$

d) $0 < x \le 1$

17) If

$$f(x) = \begin{cases} \frac{1}{|x|} & ; |x| \ge 1 \\ ax^2 + b & ; |x| < 1 \end{cases}$$

is differentiable at every point of the domain, then the values of a and b are respectively

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

b) $\frac{1}{2}, = \frac{3}{2}$

c) $\frac{5}{2}, -\frac{3}{2}$

d) $-\frac{1}{2}, \frac{3}{2}$

18) The sum pf all the 4−digit distinct numbers that can be formed with the digits $1, 2, 2, 3$ is,

a) 26664

b) 122664

c) 122234

d) 22264

19) Let ,

$$A + 2B = \begin{pmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{pmatrix}$$

$$2A - B = \begin{pmatrix} 2 & -1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{pmatrix}$$

If $tr(A)$ denotes the sum of all diagonal entries of the matrix A, then $tr(A) - tr(B)$ is,

a) 0 b) 1

c) 2 d) 3

20) The value of

$$3+\cfrac{1}{4+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{3+\ldots\infty}}}}$$

is equal to,

a) $1.5+\sqrt{3}$ b) $2+\sqrt{3}$

c) $3+2\sqrt{3}$ d) $4+\sqrt{3}$

21) The number of times digit 3 will be written when listing the integers from 1 to 1000 is _____

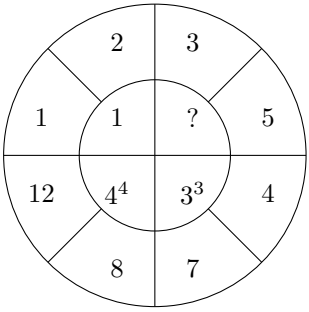
22) The equation of the planes parallel to the plane $x-2y+2z-3=0$ which are at unit distace from the point $(1,2,3)$ is $ax+by+cz+d=0$. If $(b-d)=k(c-a)$, then the positive value of k is_____

23) Let $f(x), g(x)$ be two functions satisfying $f\left(x^2\right)+g(4-x)=4x^3$ and $g(4-x)+g(x)=0$, then the value of $\int_{-4}^{4} f\left(x^2\right)dx$ is,_____

24) The mean age of 25 teachers in a school is 40 years. A teacher retires at the age of 60 years and a new teacher is appointed in his place. If the mean age of the teachers in this school now is 39 years, then the age of the newly appointed teacher is_____

25) A square $ABCD$ has all its vertices on the curve $x^2y^2=1$. The midpoints of its sides also lie on the same curve. Then, the square of the area of $ABCD$ is_____

26) The missing value in the following figure is,_____



27) The number of solutions of the equation $|\cot x|=\cot x+\left(\frac{1}{\sin x}\right)$ in the interval $[0,2\pi]$ is_____

28) Let z_1, z_2 be the roots of the equations $z_2+a_z+12=0$ and z_1, z_2 form an equilateral triangle with origin. Then, the value of $|a|$ is _____

29) Let the plane $ax + by + cz + d = 0$ bisect the line joining the points $\begin{pmatrix} 4 \\ -3 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ 3 \\ -5 \end{pmatrix}$ at right angles. If a, b, c, d are integers, then the minimum value of $\left(a^2 + b^2 + c^2 + d^2\right)$ is,_____

30) If $f(x) = \int \frac{[5x^8 + x^6]}{[x^2 + 1 + 2x^7]^2} dx, (x \geq 0)$, $f(0) = 0$ and $f(1) = \frac{1}{k}$, then the value of k is,_____