

2020-Sept Session-09-04-2020 shift¹

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1 1-15(MATH)

- 1) Suppose the vectors x_1 , x_2 and x_3 are the solutions of the system of linear equations, $A\mathbf{x} = \mathbf{b}$ when the vector \mathbf{b} on the right side is equal to b_1 , b_2 and b_3 respectively. If $x_1 = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$, $x_2 = \begin{pmatrix} 0 \\ 2 \\ 1 \end{pmatrix}$, $x_3 = \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$, $b_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$, $b_2 = \begin{pmatrix} 0 \\ 2 \\ 0 \end{pmatrix}$, $b_3 = \begin{pmatrix} 0 \\ 2 \\ 2 \end{pmatrix}$, then the determinant of A is equal to

- a) 2
- b) $\frac{1}{3}$
- c) $\frac{3}{2}$
- d) 4

- 2) If a and b are real numbers such that $(2 + \alpha)^4 = a + b\alpha$, where $\alpha = \frac{-1+i\sqrt{3}}{2}$ then $a + b$ is equal to:

- a) 33
- b) 57
- c) 9
- d) 24

- 3) The distance of the point $\begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$ from the plane $x - y + z = 5$ measured parallel to the

line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$ is:

- a) $\frac{1}{7}$
- b) 7
- c) $\frac{7}{5}$
- d) 1

- 4) Let $f : (0, \infty) \rightarrow (0, \infty)$ be a differentiable function such that $f(1) = e$ and

$$\lim_{t \rightarrow x} \frac{t^2 f^2(x) - x^2 f^2(t)}{t - x} = 0 \quad (4.1)$$

(4.2)

If $f(x) = 1$, then x is equal to:

- a) e
- b) $2e$
- c) $\frac{1}{e}$

d) $\frac{2}{e}$

5) Contrapositive of the statement :

If a function f is differentiable at a , then it is also continuous at a , is:

- a) If a function f is not continuous at a , then it is not differentiable at a .
- b) If a function f is continuous at a , then it is differentiable at a .
- c) If a function f is continuous at a , then it is not differentiable at a .
- d) If a function f is continuous at a , then it is not differentiable at a .

6) The minimum value of $2^{\sin(x)} + 2^{\cos(x)}$ is:

- a) $2^{1-\sqrt{2}}$
- b) $2^{1-\frac{1}{\sqrt{2}}}$
- c) $2^{-1+\sqrt{2}}$
- d) $2^{-1+\frac{1}{\sqrt{2}}}$

7) If the perpendicular bisector of the line segment joining the points $P\left(\frac{1}{4}\right)$ and $Q\left(\frac{k}{3}\right)$ has y-intercept equal to -4, then a value of k is:

- a) -2
- b) $\sqrt{15}$
- c) $\sqrt{14}$
- d) -4

8) The area (in sq. units) of the largest rectangle $ABCD$ whose vertices A and B lie on the x -axis and vertices C and D lie on the parabola, $y = x^2 - 1$ below the x -axis, is:

- a) $\frac{2}{3\sqrt{3}}$
- b) $\frac{4}{3}$
- c) $\frac{1}{3\sqrt{3}}$
- d) $\frac{4}{3\sqrt{3}}$

9) The integral

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \tan^3 x \sin^2 3x (2 \sec^2 x \sin^2 3x + 3 \tan x \sin 6x) dx \text{ is equal to}$$

- a) $\frac{9}{2}$
- b) $\frac{1}{18}$
- c) $\frac{-1}{18}$
- d) $\frac{7}{18}$

10) If the system of equations

$$x + y + z = 2$$

$$2x + 4y - z = 6$$

$$3x + 2y + \lambda z = \mu$$

has infinitely many solutions, then

- a) $\lambda - 2\mu = -5$
- b) $2\lambda + \mu = 14$
- c) $\lambda + 2\mu = 14$

d) $2\lambda - \mu = 5$

- 11) In a game two players A and B take turns in throwing a pair of fair dice starting with player A and total of scores on the two dice, in each throw is noted. A wins the game if he throws a total of 6 before B throws a total of 7 and B wins the game if he throws a total of 7 before A throws a total of six. The game stops as soon as either of the players wins. The probability of A winning the game is :

- a) $\frac{5}{31}$
 b) $\frac{61}{30}$
 c) $\frac{30}{61}$
 d) $\frac{5}{6}$

- 12) If for some positive integer n , the coefficients of three consecutive terms in the binomial expansion of $(1+x)^{n+5}$ are in the ratio 5 : 10 : 14, then the largest coefficient in this expansion is :

- a) 792
 b) 252
 c) 462
 d) 330

- 13) The function

$$f(x) = \begin{cases} \frac{\pi}{4} + \tan^{-1} x & \text{if } |x| \leq 1 \\ \frac{1}{2}(|x| - 1) & \text{if } |x| > 1 \end{cases}$$

- a) both continuous and differentiable on $R - \{-1\}$
 b) continuous on $R - \{-1\}$ and differentiable on $R - \{-1, 1\}$
 c) continuous on $R - \{1\}$ and differentiable on $R - \{-1, 1\}$
 d) both continuous and differentiable on $R - \{1\}$

- 14) The solution of the differential equation $\frac{dy}{dx} - \frac{y+3x}{\log_e y+3x} + 3 = 0$ is: where c is a constant of integration

- a) $x - \log_e y + 3x = c$
 b) $x - \frac{1}{2}(\log_e y + 3x^2) = c$
 c) $x - 2 \log_e y + 3x = c$
 d) $y + 3x - \frac{1}{2} \log_e x^2 = c$

- 15) Let $\lambda \neq 0$ be in R . If α and β are the roots of the equation, $x^2 - x + 2\lambda = 0$ and α and γ are the roots of the equation, $3x^2 - 10x + 27\lambda = 0$, then $\frac{\beta\gamma}{\lambda}$ is equal to:

- a) 27
 b) 9
 c) 18
 d) 36