

BITS, PILANI - DUBAI
INTERNATIONAL ACADEMIC CITY, DUBAI
 First Year – Semester I (2008-09)
REMEDIAL MATHEMATICS (MATH D021)
TEST –I (Closed Book)

Date : 19.10.08.
 Time: 50 minutes

Max. Marks : 50
 Weightage : 25%

Answer all the questions

1. How many terms of the G.P. $3, 3/2, 3/4, \dots$ are needed to give the sum $3069/512$. (5 marks)
2. The sum of first three terms of a G.P. is $13/12$ and their product is -1 . Find the common ratio and the terms. (5 marks)
3. If $1/6! + 1/7! = x/8!$, find x . (5 marks)
4. Find the value of n such that $nP_5 = 42 nP_3$, $n > 4$. (5 marks)

5. Given

$$3 \begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix},$$

(5 marks)

find the values of x, y, z and w .

6.

If $A' = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$, then find $(A + 2B)'$

(5 marks)

7.

For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that

- (i) $(A + A')$ is a symmetric matrix
- (ii) $(A - A')$ is a skew symmetric matrix

(5 marks)

8.

Find the product of matrices

$$\begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 2 & -3 \\ 1 & 0 \\ 3 & 1 \end{bmatrix}$$

(7 marks)

9. Evaluate the determinant

$$\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$$

(8 marks)

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First Year – Semester I (2008-09)
REMEDIAL MATHEMATICS (MATH D021)
TEST -2 (open Book)

Date : 10.12.08.
Time: 50 minutes

Max. Marks : 40
Weightage : 20%

Answer all the questions
(Each qn. Carries 4 marks - $10 \times 4 = 40$ marks)

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1. Find a unit vector perpendicular to the plane of P(1,-1,2), Q(2,0,-1) , R(0,2,1).
 - 2 Find the distance from the point (2,2,3) to the plane $2x + y + 2z = 4$.
 3. Find the average rate of change of the function $h(t) = 2 + \cos(t)$ over the given interval $(-\pi, \pi)$

4. Find $\lim_{x \rightarrow -1} (\sqrt{x^2 + 8} - 3) / (x+1)$

5. If $(2 - x^2) < g(x) < 2\cos(x)$, for all x , find $\lim_{x \rightarrow 0} g(x)$

6. At what points of x the following function is continuous.

$$y = (x \cot x) / (\sqrt{x^2 + 1})$$

7. Using the definition of finding the derivative of a function , find the derivative of $f(x) = (x + 2)^2 + 6x$ and also find $f'(2)$.

8. Apply the product rule to find dy/dx and d^2y/dx^2 if $y = (x^4 + 2\sqrt{x}) \cot(3x^2)$

9. Apply the quotient rule to find dy/dx if

$$y = \cos^2 x / (\sin^2 x + \cos x)$$

10. Find dy/dx if $y = \tan^2 u$ and $u = -(1/5) x^{(3/2)}$

BITS , PILANI - DUBAI
INTERNATIONAL ACADEMIC CITY, DUBAI
 First Year – Semester I (2008-09)
REMEDIAL MATHEMATICS (MATH D021)
 Comprehensive Examination(Closed Book)

Date : 05.01.09
Time: 3 hours

Max. Marks : 100
Weightage : 40%

Note: Answer all the questions sequentially

1. a. Find the five numbers between 8 and 26 such that the resulting sequence is in A.P.
 b. How many terms of G.P. $3, 3^2, 3^3, \dots$ are needed to give the sum 120.

(3+3)

2. a. Find r if $5[{}^r P_1] = 6[{}^r P_{r-1}]$

b. If $1/12! + 1/13! = x/14!$, find x .

(3+3)

3. a. Express $\mathbf{v} = 2\mathbf{i} + 6\mathbf{j}$ as a product of its length and direction.

- b. Find a unit vector \mathbf{u} in the direction of the vector from $P_1(3,4,5)$ to $P_2(6,7,8)$.

(3+3)

4. Express $\mathbf{B} = 2\mathbf{i} + \mathbf{j} - 3\mathbf{k}$ as the sum of the vector parallel to $\mathbf{A} = 3\mathbf{i} - 4\mathbf{j}$ and a vector orthogonal to \mathbf{A} .

(4)

5. a. Find the area of the triangle with vertices $P(1,-1,0)$, $Q(2,1,-1)$ and $R(-1,1,2)$.

- b. Find the angle between the planes $3x-6y-2z=15$ and $2x+y-2z=5$.

(3+3)

6. Construct a 3×4 matrix A whose elements are given by $a_{ij} = \frac{1}{2} |-3i+j|$.

(4)

7. If $A^t = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$ then find $(A + 2B^t)$

(4)

8. Find the inverse of the matrix

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix} \text{ using its adjoint matrix.}$$

(5)

9. a. If $A = \{1,2,3,4,5\}$, $B = \{4,5,6,7,8\}$. Find i) $A \cup B$ ii) $A \cap B$

iii) Show that $A = (A \cap B) \cup (A - B)$

- b. If $A = \{3,5,7,9,11\}$, $B = \{7,9,11,13\}$, $C = \{11,13,15\}$ and $D = \{15,17\}$

find i) $(A \cap B) \cap (B \cup C)$ ii) $(A \cup D) \cap (B \cup C)$.

(3+3)

(P.T.O.)

10. Find the average rate of change of the function $f(x) = \sqrt{4x+1}$ over the interval $[0,2]$. (4)

11. Find $\lim_{x \rightarrow -1} (\sqrt{x^2+8} - 3) / (x+1)$ (4)

12. At what points of x , the function $y = (\sqrt{x^4+1}) / (1+\sin(x))$ is continuous? (4)

13. Find the tangent line to the curve $y = x + 9/x$ at $x = -2$. (4)

14. If $y = (2x+5)/(3x+2)$, find y' and y'' . (5)

15. Find dy/dx if $y = x^2 \sin(x) + 2x \cos(x) - 2 \sin(x)$. (4)

16. If $y = -\sec(u)$ and $u = x^2 + 7x$, find dy/dx . (4)

17. Find the value of c which satisfies the mean value theorem for the function $f(x) = x + 1/x$ in $[1/2, 2]$. (4)

18. Evaluate $\int_{-1}^1 3x^2 \sqrt{x^3+1} dx$ (5)

19. Evaluate $\int_1^e x^3 \ln(x) dx$ using integration by parts (5)

20. a. Find $\int x^2 \sin(x^3) dx$
b. Evaluate $\int (5x-3) / [(x+1)(x-3)] dx$ (5+5)