Matrices & Determinant Test No. 1

1. Let f (x) = $\begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x^2 & 2x \\ \tan x & x & 1 \end{vmatrix}$. Then $\lim_{x\to 0} \frac{f'(x)}{x}$ is equal to

(a) 0
(b) –1
(c) –2
(d) 1

2. Let f (x) = $\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$. Then the maximum value of f (x) is

(a) 2
(b) 4
(c) 6
(d) 8

3. If $0 \le x \le 1$ and f(x) = $\begin{vmatrix} x & 1 & 1 \\ -1 & x & 1 \\ -1 & -1 & x \end{vmatrix}$, then

(a) least value of f(x) is 2
(b) greatest value of f(x) is 4
(c) f(x) has a local maximum at x = $\frac{2}{3}$
(d) f(x) has a local minimum at x = $\frac{1}{3}$

4. If $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$

are the given determinants, then

(a) $\Delta_1 = 3(\Delta_2)^2$
(b) $(d/dx)\Delta_1 = 3\Delta_2$
(c) $(d/dx)\Delta_1 = 3(\Delta_2)^2$
(d) $\Delta_1 = 3\Delta_2^{3/2}$

5. If ω is a cube root of unity, then a root of the following equation is $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix}$

(a) x = 1
(b) x = ω
(c) $x = \omega^2$
(d) x =0

6. If system of linear equations $x + y + z = 2$, $2x + y - z = 3$, $3x + 2y + kz = 4$ has a unique solution if

(a) $k \neq 0$
(b) $-1 < k < 1$
(c) $-2 < k < 2$
(d) $k = 0$

7. From the matrix equation AB = AC we can conclude B = C provided

(a) A is singular
(b) A is non–singular
(c) A is symmetric
(d) not necessarily exists

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8. If $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, the value of X^n is

(a) $\begin{bmatrix} 3n & -4n \\ n & -n \end{bmatrix}$ (b) $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$

(c) $\begin{bmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{bmatrix}$ (d) none of these

9. If A and B are two matrices such that AB = B and BA = A, then $A^2 + B^2 =$

(a) 2AB (b) 2BA

(c) A + B (d) AB

10. If $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $G(y) = \begin{bmatrix} \cos x & 0 & \sin x \\ 0 & 1 & 0 \\ -\sin x & 0 & \cos x \end{bmatrix}$, then $[F(x)G(y)]^{-1}$ is equal to

(a) $F(-x)G(-y)$ (b) $F(x^{-1})G(y^{-1})$

(c) $G(-y)F(-x)$ (d) $G(y^{-1})F(x^{-1})$

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