

Sample short question

Q 1. The determinant of matrix $A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 8 & 1 & 7 & 2 \\ 2 & 0 & 2 & 0 \\ 9 & 0 & 6 & 1 \end{bmatrix}$ is

- (a) 5 (b) 0
(c) 4 (d) 20

Solution:

- (a) (b) (c)✓ (d)

Q 2. If $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$, then the Eigenvalues of A^{19} are

- (a) 1024 and -1024 (b) $1024\sqrt{2}$ and $-1024\sqrt{2}$
(c) $4\sqrt{2}$ and $-4\sqrt{2}$ (d) $512\sqrt{2}$ and $-512\sqrt{2}$

Solution:

- (a) (b) (c) (d)✓

Q 3. Which one of the following is NOT EQUAL TO $\det \begin{pmatrix} \begin{bmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{bmatrix} \end{pmatrix}$

- (a) $\det \begin{pmatrix} \begin{bmatrix} 1 & x(x+1) & (x+1) \\ 1 & y(y+1) & (y+1) \\ 1 & z(z+1) & (z+1) \end{bmatrix} \end{pmatrix}$ (b) $\det \begin{pmatrix} \begin{bmatrix} 1 & x+1 & x^2+1 \\ 1 & y+1 & y^2+1 \\ 1 & z+1 & z^2+1 \end{bmatrix} \end{pmatrix}$
(c) $\det \begin{pmatrix} \begin{bmatrix} 0 & x-y & x^2-y^2 \\ 0 & y-z & y^2-z^2 \\ 1 & z & z^2 \end{bmatrix} \end{pmatrix}$ (d) $\det \begin{pmatrix} \begin{bmatrix} 2 & x+y & x^2+y^2 \\ 2 & y+z & y^2+z^2 \\ 1 & z & z^2 \end{bmatrix} \end{pmatrix}$

Solution:

- (a)✓ (b) (c) (d)

Q 4. Consider four matrices A, B, C and D of respective dimensions $30 \times 35, 35 \times 15, 15 \times 5$ and 5×10 . How many scalar products are involved in the computation of the matrix product $ABCD$.

- (a) 14875 (b) 21000
(c) 9375 (d) 11875

Solution:

- (a) (b) (c)✓ (d)

Q 5. The value of $\lim_{n \rightarrow \infty} \left(1 - \frac{1}{n}\right)^{2n}$ is

- (a) 0 (b) e^{-2}
(c) $e^{-0.5}$ (d) 1

Solution:

- (a) (b)✓ (c) (d)

Q 6. Which one of the following functions is continuous at $x = 3$?

- (a) $f(x) = \begin{cases} 2; & x = 3 \\ x - 1; & x > 3 \\ \frac{x+3}{3}; & x < 3 \end{cases}$ (b) $f(x) = \begin{cases} 4; & x = 3 \\ 8 - x; & x \neq 3 \end{cases}$
(c) $f(x) = \begin{cases} x + 3; & x \leq 3 \\ x - 4; & x > 3 \end{cases}$ (d) $f(x) = \frac{1}{x^3 - 27}; x \neq 3$

Solution:

- (a)✓ (b) (c) (d)

Q 7. The value of $\int_0^{\frac{\pi}{4}} \frac{1 - \tan(x)}{1 + \tan(x)} dx$ is

- (a) 0 (b) 1
(c) $\ln 2$ (d) $0.5\ln 2$

Solution:

- (a) (b) (c) (d)✓

Q 8. The minimum value of $f(x) = 2x^2 - 8x - 3$ in interval $[0, 5]$ is

- (a) -15 (b) 7
(c) -11 (d) -3

Solution:

- (a) (b) (c)✓ (d)

Q 9. Suppose a fair six-sided die is rolled once. If the value on the die is 1, 2 or 3, then the die is rolled a second time. What is the probability that the sum total of values that turn up is at least 6?

- (a) $\frac{10}{21}$ (b) $\frac{5}{12}$
(c) $\frac{2}{3}$ (d) $\frac{1}{6}$

Solution:

- (a) (b)✓ (c) (d)

Q 10. Two persons X and Y decide to independently roll two identical dice, each with 6 faces, numbered 1 to 6. The person with lower number wins. In case of a tie, they roll the dice repeatedly until there is no tie. A trial is defined as a throw of the dice by P and Q. Assume that all 6 numbers on each dice are equi-probable and that all trials are independent. The probability (rounded to 3 decimal places) that one of them wins on the third trial is

- (a) 0.694 (b) 0.116
(c) 0.023 (d) 0.463

Solution:

- (a) (b) (c)✓ (d)