PU M Sc Mathematics

1 of 100

140 PU_2015_372

The trace of a n x n invertible matrix A:-

- always non-zero
- n
- May be zero
- Always positive

2 of 100

116 PU_2015_372

The statement $2^n < n!$:-

- Is true for all positive integers n
- Is not true for all positive integers n
- Is true for finite number of positive integers
- Is not true for finite number of positive integers

3 of 100

145 PU_2015_372

If $\begin{pmatrix} x+y & z+t \\ x-t & x-y \end{pmatrix} = \begin{pmatrix} 20 & 8 \\ 4 & 12 \end{pmatrix}$, then (x,y,z,t) is:-

- (2,6,4,16)
- (16,4,-4,-12)
- (16,4,-4,12)
- (16,4,4,12)

4 of 100

123 PU_2015_372

If G is an infinite cyclic group then which one is not a correct answer?

- Every subgroup is cyclic
- Every subgroup is abelian
- Every subgroup is normal subgroup of G
- Every element of G, which is not an identity element is a generator of G

5 of 100

108 PU_2015_372

The subset $\{z \in C \mid Im(z) > 1\}$ of the complex plane is:-

- Compact
- Disconnected

- Connected
- Multiple connected

6 of 100
196 PU_2015_372

The initial value problem $x\frac{dy}{dx} = y + x^2, x > 0; y(0) = 0$ has:-

- Infinitely many solutions
- Exactly two solutions
- A unique solution
- No solution

7 of 100
147 PU_2015_372

The number of ways of distributing 10 prizes to 6 students if each student can receive any number of prizes is:-

- 10^6
- 6^{10}
- 60
- 6

8 of 100
149 PU_2015_372

Let A be a matrix and A^t denotes the transpose of A. Which one is not correct?

- $(A + B)^t = A^t + B^t$
- $(AB)^t = A^tB^t$
- $(A^t)^t = A$
- $(kA)^t = kA^t$

9 of 100
154 PU_2015_372

If a set A has n elements, then the total number of non-empty subsets of A is:-

- 2^n
- n
- $2^n - 1$
- n^2

10 of 100
178 PU_2015_372

$$\lim_{x\to 0} \frac{\cot x + \cot 2x}{\cot 3x} =$$

- $\frac{9}{2}$
- $\frac{2}{3}$
- 1
- 0

11 of 100

150 PU_2015_372

If f is a continuous function on [a,b] and f'(c) is positive for all c in (a,b), then f is:-

- Constant
- f is always non-negative
- Decreasing
- Increasing

12 of 100

197 PU_2015_372

The maximum number of linearly independent solutions of the differential equation $\frac{d^4y}{dx^4} = 0$, with the condition y(0) = 1 is:-

- 4
- 3
- 2
- 1

13 of 100

105 PU_2015_372

The solution of the initial value problem y' = -2xy, y(0) = 2 is:-

- $2e^{-x^2}$
- $e^{-x}\cos x$
- $e^{x}\sin x$
- $e^{x}\cos x$

14 of 100

155 PU_2015_372

If $y = (x + 3)^2$, then $(-2x - 6)^2 =$

- 4y

- $-2y^2$
- $-4y$
- $2y$

15 of 100

121 PU_2015_372

If K is kernel of a group homomorphism f: G → H, then which statement is not true?

- K is an abelian subgroup of G
- K is a normal subgroup of G
- K = {e} for some homomorphisms
- K = G for some homomorphisms

16 of 100

113 PU_2015_372

The equation of the sphere through the circle $x^2+y^2+z^2+=9, 2x+3y+4z=5$ and the point (1,2,3) is:-

- $4(x^2+y^2+z^2)-2x-3y-5z-2=0$
- $x^2+y^2+z^2-2x-3y-4z-20=0$
- $3(x^2+y^2+z^2)-2x-3y-4z-22=0$
- $x^2+y^2+z^2-3x-4y-5z-25=0$

17 of 100

174 PU_2015_372

Ten points are given in a plane where no three are collinear. Then the number of different line segments that can be formed by joining these points is:-

- $\binom{10}{3}$
- $\binom{10}{2}$
- 0
- 10!

18 of 100

190 PU_2015_372

Let H be a finite subset of a group G and has 4 elements. Then H is not a subgroup of G if:-

- G is an infinite group
- o(G) = 26
- o(G) = 4
- G is isomorphic to a permutation group S_n, $n \geq 4$

19 of 100

141 PU_2015_372

If T:U → V is a linear transformation which of the following is true?

- Rank of T - Nullity of T = dim U
- Rank of T + Nullity of T = dim V
- Rank of T + Nullity of T = dim U
- Rank of T + Nullity of T = dim (U + V)

20 of 100

177 PU_2015_372

What is the period of sinh(x+iy)?

- π
- πi
- 2π
- $2\pi i$

21 of 100

152 PU_2015_372

The number of tangents that can be drawn from (0, 0) to the circle $x^2 + y^2 + 2x + 6y - 15$ is:-

- One
- Two
- Infinite
- Zero

22 of 100

107 PU_2015_372

The value of the integral of $\oint_C (z-a)^{-1}$ dz (where C is the circle |Z - a| = 1) is:-

- 0
- $2\pi i$
- 2
- π

23 of 100

110 PU_2015_372

If (l_1, m_1, n_1) and (l_2, m_2, n_2) represents the direction cosines of two lines which are perpendicular then:-

- $l_1 l_2 + m_1 m_2 + n_1 n_2 = 0$

- $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$
- $(l_1 + m_1 + n_1)(l_1 + m_1 + n_1) = 0$
- $l_1 l_2 + m_1 m_2 - n_1 n_2 = 0$

24 of 100

195 PU_2015_372

A binary operator on a set S is:-

- A one to one but need not be onto function from S × S to S
- An onto but need not to be a one to one function from S × S to S
- A bijective function from S × S to S
- A function from S × S to S

25 of 100

124 PU_2015_372

Which of the following iterative formula denote Euler's method?

- $Y_{n+1} = y_n + h\, f(x_n, y_n)$
- $Y_{n+1} = y_n - h\, f(x_n, y_n)$
- $Y_{n+1} = y_n + \frac{h}{2} f(x_n, y_n)$
- $Y_{n+1} = y_n - \frac{h}{2} f(x_n, y_n)$

26 of 100

210 PU_2015_372

Let X and Y be two non empty sets and let $f: X \rightarrow Y$. If $A_i \subseteq X$ and $B_i \subseteq Y$, then:-

- $f(\cap_i A_i) = \cap_i f(A_i)$
- $\cap_i f(A_i) \subseteq f(\cap_i A_i)$
- $\cup_i f(A_i)$ and $f(\cup_i A_i)$ are not related
- $f(\cap_i A_i) \subseteq \cap_i f(A_i)$

27 of 100

199 PU_2015_372

The equation $(\alpha x y^3 + y \cos x)\, dx + (x^2 y^2 + \beta \sin x)\, dy = 0$ is exact for:-

- $\alpha = \frac{3}{2}, \beta = 1$

- $\alpha = 1, \beta = \frac{3}{2}$
- $\alpha = \frac{2}{3}, \beta = 1$
- $\alpha = 1, \beta = \frac{2}{3}$

28 of 100

173 PU_2015_372

If $f(2a - x) = -f(x)$ for all $x \in [0, 2a]$, then $\int_0^{2a} f(x)dx =$

- 2*a*
- *a*
- 0
- a^2

29 of 100

115 PU_2015_372

How many permutations of the letter a,b,c,d,e,f,g does not contain '*bge*' ?

- 7! - 4!
- 7! - 5!
- $\frac{7!}{4!}$
- $\frac{7!}{5!}$

30 of 100

153 PU_2015_372

If | x - 2 | + | x - 3 | = 7 , then x =

- 7
- 8
- 6 or -1
- -2

31 of 100

198 PU_2015_372

If $D = \frac{d}{dx}$ then the value of $\frac{1}{(xD+1)}(x^{-1})$ is:-

- $\log x$
- $\frac{\log x}{x}$
- $\frac{\log x}{x^2}$
- $\frac{\log x}{x^3}$

32 of 100

213 PU_2015_372

The value of *k* if the line passing through the points (1,4) and (6, *k*) and is parallel to the line 5*x* - *y* = 3.

- 29
- 28
- -29
- -28

33 of 100

142 PU_2015_372

Which of the following statement is a tautology?

- p ∨ q
- p ∧ q
- p ∨ (~p)
- q ∨ (~q)

34 of 100

211 PU_2015_372

The area of the region bounded by the curves $y^2 = x - 1$ and $y = x - 3$ is:-

- $\frac{9}{2}$
- $\frac{2}{9}$
- $\frac{3}{7}$
- $\frac{7}{3}$

35 of 100

112 PU_2015_372

A sphere is inscribed in the tetrahedron whose faces are $x=0, y=0, z=0, 2x+6y+3z=14$. Then the radius of the sphere is:-

- $\frac{7}{6}$
- $\frac{7}{9}$
- $\frac{7}{2}$
- $\sqrt{\frac{7}{9}}$

36 of 100

215 PU_2015_372

Which of the following statements is true?

- In an infinite group every element is of infinite order
- If in a group every element is of finite order, then the group must be a finite group
- In a finite group every element is of finite order
- If every proper subgroup of a group is cyclic, then the group must be cyclic

37 of 100

176 PU_2015_372

$\text{Cosh}^2x + \sinh^2x =$

- 1
- 0
- Cosh2x
- Sinh2x

38 of 100

111 PU_2015_372

What is the distance between the two planes $2x-3y+6z+12=0$ and the plane $2x-3y+8z=0$?

- $\frac{2}{\sqrt{6}}$
- $\frac{2}{7}$
- 0
- Cannot be determined

39 of 100

114 PU_2015_372

Which of the following is false?

- The set of all natural numbers and the set of all integers have same cardinality
- The set of all rational numbers and the set of all integers have same cardinality

The cardinality of the set of real numbers is greater than that of the set of real numbers in the interval (0,1)

The cardinality of the power set of integers is greater than that of the set of integers

40 of 100

109 PU_2015_372

Which of the following defines a metric on **R**?

- $d(x,y)=(x-y)^2$
- $d(x,y)=x-y$
- $d(x,y)=\frac{|x-y|}{1+|x-y|}$
- $d(x,y)=|x|+|y|+1$

41 of 100

179 PU_2015_372

$\sin^{-1}x+\cos^{-1}x=$

- 1
- 0
- π
- $\pi/2$

42 of 100

120 PU_2015_372

If H is a normal subgroup of G, then:-

- N(H) = {e}, the trivial subgroup
- N(H) = H
- N(H) = G
- A proper subgroup of H

43 of 100

212 PU_2015_372

If $f: R \rightarrow R$ and $a \in R$ is such that $f(a)=0$ and $f'(a)=6$ then $\lim_{h\rightarrow 0}\frac{f(a+h)}{2h}=$

- 3
- 2

1

0

44 of 100

206 PU_2015_372

Which of the following cannot be the degree sequence of any graph?

{1,1,2,3,1,1,2,5,6,5}

{1,1,1,1,1,1,1,7}

{1,2,2,2,2,2,1}

{6,6,6,6,6,6,6}

45 of 100

208 PU_2015_372

$\int_C \frac{1}{2z+3}\,dz$ where C is $|Z|=2$ is:-

$2\pi i$

πi

0

1

46 of 100

214 PU_2015_372

The value of $k \in (0,1)$ such that the area under $y = x^2$ from 0 to k is equal to the area under the same curve from *k* to 1.

$\frac{1}{2\sqrt{3}}$

$\frac{1}{\sqrt[3]{2}}$

$\frac{1}{\sqrt[2]{3}}$

$\frac{1}{3\sqrt{2}}$

47 of 100

207 PU_2015_372

$$\lim_{\theta \to 0} \frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} =$$

- 1
- 0
- 2
- 1/2

48 of 100

171 PU_2015_372

A function f(x) is an even function if:-

- $f(x) = f(x^2)$
- $f(x) = f(-x^2)$
- $f(x) = f(-x)$
- $f(x) = -f(-x)$

49 of 100

151 PU_2015_372

$\sqrt{-2}\sqrt{-3} =$

- $\sqrt{6}$
- $-\sqrt{6}$
- $i\sqrt{6}$
- $\sqrt{2}\sqrt{-3}$

50 of 100

143 PU_2015_372

The binary operation * is defined on a set of ordered pairs of real numbers as (a,b)*(c,d) = (ad + bc, bd) and * is associative. Then, (1,2) * (3,5) * (3,4) is:-

- (32,40)
- (23,11)
- (74,30)
- (7,11)

51 of 100

175 PU_2015_372

A student must answer exactly eight questions out of ten on a final examination. In how many ways can she choose the questions to answer so that she must answer the first three questions?

- $\binom{7}{5}$
- $\binom{10}{8} - 3!$
- $10^4 - 3!$
- $\binom{10}{8}$

52 of 100

122 PU_2015_372

If a finite group G has two elements a,b having orders 6 and 15, then:-

- 90 divides o(G)
- 30 divides o(G) but 90 need not divide o(G)
- 3 divides o(G) but 30 need not divide o(G)
- 3 does not divide o(G)

53 of 100

106 PU_2015_372

If f(z) = u (x, y) + iv (x, y) is analytic, then f '(z) is:-

- $\frac{\partial u}{\partial x} - i\frac{\partial v}{\partial x}$
- $\frac{\partial u}{\partial x} + i\frac{\partial u}{\partial y}$
- $\frac{\partial u}{\partial x} - i\frac{\partial v}{\partial y}$
- $\frac{\partial v}{\partial y} - i\frac{\partial v}{\partial x}$

54 of 100

209 PU_2015_372

For the function $\frac{e^z}{z^2+4}$.

- z = 0 is a simple pole
- z = 0 is a removable singularity
- z = 0 is a removable singularity and z = 2i is the only simple pole
- z = 0 is a removable singularity and z = ± 2i are simple pole

55 of 100

144 PU_2015_372

If |A| = 20, |B| = 10 and |A ∪ B| = 30, then, |A ∩ B| is:-

10

20

30

0

56 of 100

146 PU_2015_372

If $\sum_{i=0}^{n} \binom{n}{i}$, then n is:-

5

6

7

8

57 of 100

148 PU_2015_372

Let H and K be finite subgroups of a group G. Then, O(HK) is:-

$O(G)O(K)$

$\frac{O(H \cap K)}{O(H)O(K)}$

$\frac{O(H)O(K)}{O(H \cap K)}$

$\frac{O(H \cap K)}{O(H \cup K)}$

58 of 100

172 PU_2015_372

Evaluate $\int_{-a}^{a} x^3 \sqrt{a^2 - x^2}\, dx$.

a^3

$2a^3$

0

$5a^5$

59 of 100

125 PU_2015_372

If *f(x)* = 0 is a reciprocal equation of second type and even degree, then one of the standard reciprocal equations that can be obtained from *f(x)* is:-

- $\frac{f(x)}{x+1}$
- $\frac{f(x)}{x-1}$
- $\frac{f(x)}{x^2-1}$
- $\frac{f(x)}{x^2+1}$

60 of 100
170 PU_2015_372

The function $f(x) = \text{Sin}\frac{1}{x}$ on $(0,1)$ is:-

- Continuous
- Uniformly Continuous
- Discontinuous
- Piecewise Continuous

61 of 100
225 PU_2015_372

Which regular n-sided polygon has three times as many diagonals as sides?

- 6
- 7
- 8
- 9

62 of 100
240 PU_2015_372

If ω be an imaginary cube root of unity then $(1-\omega+\omega^2)^5+(1+\omega-\omega^2)^5$ is:-

- 64
- 32
- 16
- 8

63 of 100
223 PU_2015_372

If *a, b, c* are the intercepts of a plane which meet the coordinate axes at A,B,C respectively, then the volume of the tetrahedron OABC is given by:-

- $\frac{1}{\sqrt{3}}abc$
- $\frac{1}{3}abc$
- $\frac{1}{6}abc$
- $\frac{1}{\sqrt{6}}abc$

64 of 100

222 PU_2015_372

If f(z) is an entire function, then its Taylor series is:-

- Convergent for all z
- Divergent for all z
- Divergent if |z| > 1
- Constant

65 of 100

257 PU_2015_372

If $f(x,y) = y^2\left(e^{-x^2+y^2} + xy\sin(x^2+y^2)\right)$, then the value of $\frac{\partial f}{\partial x}$ at the point $(\pi, 0)$ is:-

- π
- $\frac{\pi}{2}$
- 0
- 1

66 of 100

244 PU_2015_372

Consider $f:[0,1] \to R$ defined as $f(x) = \begin{cases} x \text{ if } x \text{ is rational} \\ 0 \text{ if } x \text{ is irrational} \end{cases}$. The upper and lower Riemann integrals of *f* over [0,1] are given by:-

- $\underline{\int_0^1} f(x)dx = 0 = \overline{\int_0^1} f(x)dx$
- $\underline{\int_0^1} f(x)dx = 0$ and $\overline{\int_0^1} f(x)dx = \frac{1}{2}$
- $\underline{\int_0^1} f(x)dx = \frac{1}{2}$ and $\overline{\int_0^1} f(x)dx = 1$
- $\underline{\int_0^1} f(x)dx = 1 = \overline{\int_0^1} f(x)dx$

67 of 100
256 PU_2015_372

Suppose *f*: *R* → *R* is differentiable and $\lim_{x \to \infty} f'(x) = 0$. Then $\lim_{x \to \infty}[f(x+1) - f(x)] =$

- 1
- Does not exist
- 0
- -1

68 of 100
224 PU_2015_372
In how many ways is it possible to make 7 persons A, B, C, D, E, F, H sit at a round table if B, D and H insist on sitting together?

- 3!4!
- $\frac{7!}{3!}$
- $\frac{7!}{4!}$
- 3!5!

69 of 100
254 PU_2015_372

If *f*: *R* → *R* is defined as $f(x) = \begin{cases} xe^{\frac{-1}{x^2}} & if\ x \neq 0 \\ 0 & if\ x = 0 \end{cases}$ then $f'(0)$, then *f'* (0) =

- 1
- 3
- -1
- 0

70 of 100
242 PU_2015_372

The real part of $e^{e^{i\theta}}$ is:-

- $e^{\cos\theta}$
- $e^{\cos\theta}\sin(\sin\theta)$
- $e^{\cos\theta}\cos(\sin\theta)$
- $e^{\cos\theta}\sin(\cos\theta)$

71 of 100
229 PU_2015_372

If $-1+i\sqrt{3} = re^{i\theta}$, then:-

- r = 2, θ = $\pi/3$
- r = 2, θ = 2 $\pi/3$
- r = 3, θ = π
- r = 3, θ = $\pi/3$

72 of 100

255 PU_2015_372

Consider the functions *f* and *g*, both from *R* to *R* defined as $f(x) = \frac{1+x}{1+x^2}$ and $g(x) = e^{-x}$ for all *x* ∈ *R*. Then:-

- *f* is bounded but *g* is unbounded
- *f* is unbounded but *g* is bounded
- Both *f* and *g* are bounded
- Both *f* and *g* are unbounded

73 of 100

239 PU_2015_372

The value of the limit, $\lim_{n\to\infty}\left(\sqrt{n^2+n}-\sqrt{n^2+1}\right)$:-

- $\frac{1}{3}$
- $\frac{1}{4}$
- $\frac{1}{2}$
- $\frac{1}{5}$

74 of 100

243 PU_2015_372

Let x and y be limits of two subsequences of a bounded sequence (a_n) of real numbers. Consider the following statements.

(i) x = y if the sequence (a_n) is increasing sequence
(ii) x = y if the sequence (a_n) is decreasing sequence
(iii) x = y if the sequence (a_n) is convergent sequence

Then:-

- All the statements i), ii) and iii) are true
- Only iii) is true

- i) and ii) are true but not iii)
- All the three statements are false

75 of 100

246 PU_2015_372

When an edge is removed from a graph, the number of components:-

- Increase by at least one
- Increase by at most one
- Decrease by at least one
- Decrease by at most one

76 of 100

241 PU_2015_372

If z = a is an isolated singularity of f and $f(z) = \sum_{n=-\infty}^{\infty} a_n (z-a)^n$ is its Laurent series expansion in annulus $0<|a|<r$ then if $a_n = 0$ for $n< -1$, we say z=a, we say z = a is:-

- A pole of order n
- A simple pole
- A removable singularity
- An essential singularity

77 of 100

245 PU_2015_372

Given that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$. The sum of the series $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$ is:-

- $\frac{\pi^2}{8}$
- $\frac{\pi^2}{3}$
- $\frac{\pi^2}{2}$
- $\frac{\pi^2}{4}$

78 of 100

227 PU_2015_372

All the permutation groups S_n are:-

- Finite
- Non-abelian

- Cyclic
- Abelian

228 PU_2015_372
The Cantor set is:-

- Open in **R**
- Closed in R
- Dense in [0,1]
- A connected subset of **R**

226 PU_2015_372

The number of integer solutions of $x_1 + x_2 + x_3 = 5 \ (where \ x_1, x_2, x_3 \geq 1)$, is:-

- $\binom{7}{5}$
- $\binom{7}{2}$
- $\binom{4}{2}$
- $\binom{7}{3}$

280 PU_2015_372
Which of the following is false?

- There exists a continuous function mapping (0,1) onto [0,1]
- There exists a continuous function mapping (0,1) onto *R*
- There exists a continuous function mapping [0,1] ∪ [2,3] onto [0,1]
- There exists a continuous function mapping [0,1] onto (0,1)

292 PU_2015_372
The partial differential equation $x^2 \frac{\partial^2 z}{\partial x^2} - (y^2 - 1)x \frac{\partial^2 z}{\partial x \partial y} + y(y-1)^2 \frac{\partial^2 z}{\partial y^2} + x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 0$ is hyperbolic in a region in the XY-plane, if:-

- $x \neq 0 \ and \ y = 1$
- $x = 0 \ and \ y \neq 1$

- $x \neq 0 \; and \; y \neq 1$
- $x = 0 \; and \; y = 1$

83 of 100
262 PU_2015_372

For the power series $\sum_{n=0}^{\infty} \frac{n!}{n^n} z^n$ the radius of convergence is:-

- e
- 1
- ∞
- 0

84 of 100
289 PU_2015_372

The expression $\frac{1}{Dx^2 - Dy^2} \sin(x - y)$ is equal to:-

- $-\frac{x}{2} \cos(x - y)$
- $-\frac{x}{2} \sin(x - y) + \cos(x - y)$
- $-\frac{x}{2} \cos(x - y) + \sin(x - y)$
- $\frac{3x}{2} \sin(x - y)$

85 of 100
294 PU_2015_372

The value of the integral $\iint_{x^2+y^2 \leq 1} e^{-(x^2+y^2)} dxdy$ is:-

- $\pi\left(1 + \frac{1}{e}\right)$
- $\pi\left(1 - \frac{1}{e}\right)$
- $\pi\left(1 + \frac{1}{e^2}\right)$
- $\pi\left(1 - \frac{1}{e^2}\right)$

86 of 100
264 PU_2015_372

Define $f: Z \to Z$ by $f(x) = 3x^3 - x.$. Then *f* is:-

- Both one-to-one and onto
- One-to-one but not onto
- Onto but not one-to-one
- Neither one-to-one nor onto

275 PU_2015_372

$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) =$

- 1
- $\frac{\pi}{2}$
- $\frac{\pi}{3}$
- $\frac{\pi}{4}$

293 PU_2015_372

The general solution of the partial differential equation $\frac{\partial^2 z}{\partial x \partial y} = x + y$ is of the form:-

- $\frac{1}{2}xy(x+y) + F(x) + G(y)$
- $\frac{1}{2}xy(x-y) + F(x) + G(y)$
- $\frac{1}{2}xy(x-y) + F(x)G(y)$
- $\frac{1}{2}xy(x+y) + F(x)G(y)$

269 PU_2015_372

The sum of the squares of the roots of $x^3 + ax^2 - bx + c = 0$ is:-

- $a^2 - 2b$
- $a^2 + 2b$
- $b^2 - 2c$

- $a^2 + 2c$

90 of 100

268 PU_2015_372

In a group G with identity element e, the equation:-

(i) x*x = e has unique solution in G.
(ii) x*x = x has unique solution in G.

- (i) is true but (ii) is not true
- (ii) is true but (i) is not true
- Neither (i) nor (ii) is true
- Both (i) and (ii) are true

91 of 100

281 PU_2015_372

If $f(x,y) = x^2\vec{i} - xy\vec{j}$ and *C* is the line segment from (1,1) to the point (0,0) then the value of the line integral $\int_C f.d\vec{r}$ is:-

- 0
- 1
- -1
- $\frac{1}{2}$

92 of 100

277 PU_2015_372

If *f*: *R* → *R* is defined as $f(x) = \begin{cases} x^2 \sin\frac{1}{x} \, if x \neq 0 \\ 0 \quad if x = 0 \end{cases}$ then:-

- *f* is not continuous at 0
- *f* is continuous at 0 but not differentiable at 0
- *f* is differentiable but its derivative *f'* is not continuous at 0
- *f* is differentiable and its derivative *f'* is continuous at all points

93 of 100

263 PU_2015_372

A cube has edges of length *a*. The distance between a diagonal and a skew edge is:-

- $\sqrt{\frac{a}{2}}$
- $\frac{a}{2}$

- $2a$
- $\sqrt{2a}$

94 of 100

266 PU_2015_372

In how many ways can the integer 1 through 9 be permuted such that exactly four of the nine integers are in their natural positions? (D_n denotes the number of derangement of n symbols)

- $\binom{9}{5} D_5$
- $\binom{10}{5} D_5$
- $\binom{9}{4} D_5$
- $\binom{10}{4} D_4$

95 of 100

278 PU_2015_372

For what values of *a* it is true that $\lim_{n\to\infty} \frac{a^n}{n!} = 0$?

- For all $a \in R$
- Only if $|a| < 1$
- Only if $|a| = 1$
- Only if $|a| > 1$

96 of 100

276 PU_2015_372

Consider *R* with the discrete metric d. Then which of the following is true?

- The sequence $\left\{\frac{1}{n}\right\}_{n=1}^{\infty}$ is a Cauchy sequence
- The map $f:(R,d) \to (R,d)$ defined as $f(x) = \begin{cases} 1 & if\ x\ is\ rational \\ 0 & if\ x\ is\ irrational \end{cases}$ is nowhere continuous on R
- Finite sets are the only compact subsets of X
- $[0,1]$ is connected in (R,d)

97 of 100

267 PU_2015_372

If (x_n) and (y_n) are sequences of real numbers with limit points x and y, x < y only if:-

- $x_n \leq y_n$ for all n
- $x_n \leq y_n$ for infinitely many n
- $x_n \geq y_n$ for finitely many n
- $x_n \geq y_n$ for infinitely many n

98 of 100

291 PU_2015_372

If V is the solid in R^3 bounded by the cylinder $x^2 + y^2 = 1$ and the planes $z = 0$ and $z = 1$, then the value of $\iiint_V dxdydz$ is:-

- 4π
- 2π
- π
- π/2

99 of 100

279 PU_2015_372

If $a_n = \frac{1}{n^2+1}$ and $b_n = \frac{n}{3^n}$ for all $n \in N$ then:-

- Both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ are convergent.
- $\sum_{n=1}^{\infty} a_n$ is convergent but $\sum_{n=1}^{\infty} b_n$ is divergent.
- $\sum_{n=1}^{\infty} a_n$ is divergent but $\sum_{n=1}^{\infty} b_n$ is convergent.
- Both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ are divergent.

100 of 100

290 PU_2015_372

If $y = \sum_{m=0}^{\infty} C_m x^{r+m}$ is assumed to be a solution of the differential equation $x^2y'' - xy' - 3(1+x^2)y = 0$ then, the value of r are:-

- 1 and 3
- -1 and 3
- 1 and -3

○ -1 and -3