For any real number x, there exists a unique integer n such that :

(a) $n < x < n+1$

(b) $n \leq x < n+1$

(c) $n \leq x \leq n+1$

(c) None of the above [Kanpur 2018]

The least upper bound for the set $S = \left\{\pi + \frac{1}{2}, \pi + \frac{1}{4}, \pi + \frac{1}{8} \ldots\ldots\right\}$ is :

(a) π (b) $\pi + \frac{1}{2}$ (c) 0 (d) ∞

[Kanpur 2018]

The supremum of the set R is :

(a) 1 (b) ∞ (c) 0 (d) does not exist

[Kanpur 2019]

The set of $\left\{0, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\ldots, \frac{1}{n}, \ldots\ldots\right\}$ is :

(a) a closed set

(b) an open set

(c) a closed set as well as open set

(d) None of these [Kanpur 2019]

Product of two negative real numbers is :

(a) Zero (b) Positive (c) Negative (d) None of these

[Kanpur 2019]

For real numbers the correct statement is :

(a) If $a > b$, then $ac > bc$

(b) If $a > b$, then $a + c < b + c$

(c) If $a > b$, then $-a < -b$

(d) None of these [Kanpur 2019]

. Which of the following statements is true :

(a) Every finite set is open (b) A finite set may be open

(c) Every infinite set is open (d) An infinte set may be open.

. A set which is neither an interval nor an open set is :

(a) ϕ (b) N (c) R (d) Q.

. If A is any subset of R, and A° is the interior of set A, then value of $(A^\circ)^\circ$ is :

(a) A (b) A° (c) ϕ (d) none of these.

. Which one of the following sets is a perfect set ?

(a) a finite set (b) the set N of natural numbers

(c) the set Q of rational numebrs

(d) the set E = [0, 1] **[Kanpur 2018]**

. If a point $p \in S$ is not a limit point of S, then it is called :

(a) Perfect point (b) Isolated point

(c) Adherent point (d) Boundary point **[Kanpur 2018]**

. The derived set of $\{r\sqrt{2} : r \in Q\}$ is :

(a) $\{r\sqrt{2} : r \in Q\}$ (b) Q

(c) R (d) None of the above **[Kanpur 2018]**

. Which one of the following sets is compact ?

(a) $(0, 5]$ (b) $[2, \infty)$ (c) N (d) $[-1, 1] \cup [2, 3]$

[Kanpur 2018]

. The closed interval [1, 3] is a neighbourhood of :

(a) point 1 (b) point 2 (c) point 3 (d) point 1, 2 and 3

[Kanpur 2018]

. The set z of all integers is :

(a) a neighbourhood of point 3. (b) a neighbourhood of point –7.

(c) a neighbourhood of all of its points.

(d) not a neighbourhood of any sets its points. **[Kanpur 2018]**

. The set : $S = \left\{\frac{1}{2}, -\frac{1}{2}, \frac{2}{3}, -\frac{2}{3}, \frac{3}{4}, -\frac{3}{4}, \ldots, \frac{n}{n+1}, -\frac{n}{n+1} \ldots\right\}$

If $|a_n| \leq |b_n| \forall n$ and $\langle b_n \rangle$ is a null sequence, then $\langle a_n \rangle$ is :

(a) also a null sequence
(b) a divergent sequence
(c) converging to 1
(d) None of the above **[Kanpur 2018]**

The sequence $\langle x_n \rangle$, where $x_n = 3^n ; n \in \mathrm{N}$ is :

(a) divergence
(b) convergence
(c) oscillatory
(d) None of these **[Kanpur 2019]**

If in a sequence $\langle a_n \rangle$, where $a_n = \frac{n!}{n^n}$, then the sequence is :

(a) convergence to one
(b) convergence to zero
(c) convergence to ∞
(d) convergence to 2 **[Kanpur 2019]**

The sequence $\left\langle \frac{2n^2+1}{2n^2-1} \right\rangle$ converges to :

(a) 0 (b) -1 (c) 1 (d) 2 **[Kanpur 2019]**

The sequence $\langle x_n \rangle$ defined by $x_n = \left(1+\frac{1}{n}\right)^n$ is convergent and its limit lies :

(a) between 1 and 2
(b) between 2 and 4
(c) between 2 and 5
(d) between 2 and 3 **[Kanpur 2019]**

The series $\Sigma u_n(x)$ is uniformly convergent if ΣM_n is a convergent series of +ve constant, such that :

$$|u_n(x)| \le M_n \forall\, n \text{ and } x \in X$$

This test is called.

(a) Abel's test

(b) Dirichlet's test

~~(c)~~ Weierstrass M-test

(d) None of these

[Kanpur 2019]

The series $\sin x + \frac{1}{2}\sin 2x + \frac{1}{3}\sin 3x + \ldots\ldots.$:

~~(a)~~ converges uniformly in $0 < a \le x \le b < 2\pi$

(b) converges in $0 < a < x \le b < 2\pi$

(c) is divergent

(d) None of these

[Kanpur 2019]

The series $\sum_{n=0}^{\infty} a^n \cos(nx)$ is :

(a) divergent

(b) uniformly convergent when $0 < a < 2$

~~(c)~~ uniformly convergent when $0 < a < 1$

(d) None of these

[Kanpur 2019]

The series $\sum \frac{\sin(nx)}{n^{\frac{n}{2}}}$ is :

~~(a)~~ uniformly convergent and its derivative

(b) divergent

(c) uniformly convergent but its derivative is not

(d) None of these

[Kanpur 2019]

$\lim_{n \to \infty} \left(\frac{n^n}{n!} \right)^{1/n}$ is equal to :

(a) 1 (b) 0 (c) e (d) $1/e$.

For the sequence $< a_n >$, where a_n is defined as $a_n = 1 + \frac{1}{\underline{|1}} + \frac{1}{\underline{|2}} + \frac{1}{\underline{|3}} + \ldots\ldots + \frac{1}{\underline{|n}}$, which of the following statement is not true :

(a) the sequence is monotonic increasing

(b) limit of sequence lies between 2 and 3

(c) the sequence is convergent

(d) the sequence oscillates finitely.

If $|a_n| \leq |b_n| \; \forall n$ and $\langle b_n \rangle$ is a null sequence, then $\langle a_n \rangle$ is :

~~(a)~~ also a null sequence (b) a divergent sequence

(c) converging to 1 (d) None of the above **[Kanpur 2018]**

The sequence $\langle x_n \rangle$, where $x_n = 3^n; n \in \mathrm{N}$ is :

~~(a)~~ divergence (b) convergence

(c) oscillatory (d) None of these **[Kanpur 2019]**

If in a sequence $\langle a_n \rangle$, where $a_n = \frac{n!}{n^n}$, then the sequence is :

(a) convergence to one ~~(b)~~ convergence to zero

(c) convergence to ∞ (d) convergence to 2 **[Kanpur 2019]**

The sequence $\left\langle \frac{2n^2 + 1}{2n^2 - 1} \right\rangle$ converges to :

(a) 0 (b) -1 ~~(c)~~ 1 (d) 2 **[Kanpur 2019]**

The sequence $\langle x_n \rangle$ defined by $x_n = \left(1 + \frac{1}{n}\right)^n$ is convergent and its limit lies :

(a) between 1 and 2 (b) between 2 and 4

(c) between 2 and 5 ~~(d)~~ between 2 and 3 **[Kanpur 2019]**

The series $\sum_{n=1}^{\infty} (1-x)\, x^n$ is :

(a) continuous at $x = 0 \in [0, 1]$.

(b) discontinuous at $x = 0 \in [0, 1]$.

(c) uniformly convergent on $[0, 1]$.

(d) None of the above

[Kanpur 201

The sequence $\langle f_n \rangle$, where $f_n(x) = \dfrac{x^n}{n}$, $0 \le x \le 1$ converges uniformly to :

(a) 0

(b) 1

(c) $\frac{1}{2}$

(d) $\sqrt{2}$

[Kanpur 201

The series $\sum \dfrac{(-1)^{n-1}}{n} x^n$ is uniformly convergent on :

(a) (0, 1)

(b) [0, 1]

(c) [−1, 0]

(d) (−1, 0)

[Kanpur 2018, 1

The series $\sum_{n=1}^{\infty} \dfrac{1}{1+n^2 x}$:

(a) converges in [−1, 0]

(b) converges in $[1, \infty]$

(c) diverges in $[1, \infty]$

(d) None of the above

[Kanpur 201

The series $\Sigma u_n(x)$ is uniformly convergent if ΣM_n is a convergent series of +ve constant, such that :

$$|u_n(x)| \le M_n \forall\, n \text{ and } x \in X$$

This test is called.

(a) Abel's test

(b) Dirichlet's test

~~(c)~~ Weierstrass M-test

(d) None of these

[Kanpur 2019]

The series $\sin x + \frac{1}{2}\sin 2x + \frac{1}{3}\sin 3x + ...$:

~~(a)~~ converges uniformly in $0 < a \le x \le b < 2\pi$

(b) converges in $0 < a < x \le b < 2\pi$

(c) is divergent

(d) None of these

[Kanpur 2019]

The series $\sum_{n=0}^{\infty} a^n \cos(nx)$ is :

(a) divergent

(b) uniformly convergent when $0 < a < 2$

~~(c)~~ uniformly convergent when $0 < a < 1$

(d) None of these

[Kanpur 2019]

The series $\sum \frac{\sin(nx)}{n^{\frac{n}{2}}}$ is :

~~(a)~~ uniformly convergent and its derivative

(b) divergent

(c) uniformly convergent but its derivative is not

(d) None of these

[Kanpur 2019]

then kind of discontinuity of $f(x)$, at $x = 0$ is :

(a) removable discontinuity (b) discontiuity of first kind

(c) discontinuity of second kind (d) mixed discontinuity.

The function $f(x) = \tan x$ defined on the open interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ is :

(a) a continuous function. (b) a bounded function.

(c) a continuous and bounded function.

(d) a discontinuous function. **[Kanpur 2018]**

$\lim_{x \to 1} \sin \frac{1}{x-1} =$

(a) 0 (b) 1 (c) –1 (d) does not exist

[Kanpur 2018]

The function :

$$f(x) = \begin{cases} e^{\frac{1}{x}}, & \text{when } x \neq 0 \\ 0, & \text{when } x = 0 \end{cases}$$

(a) is continuous at $x = 0$ (b) is discontinuous at $x = 0$

(c) is continuous everywhere (d) None of the above **[Kanpur 2018]**

The greatest integer function $[x]$:

(a) is continuous at $x = 1$ (b) is differentiable at $x = 1$

(c) is not differentiable at $x = 1$ (d) None of the above **[Kanpur 2018]**

If f is continuous in $[a, b]$ and $f(a).f(b) < 0$, then for at least one point $c \in [a, b]$:

(a) $f(a) = f(b) = f(c)$ (b) $f(c) = 0$

(c) $f'(c) = 0$ (d) All of the above **[Kanpur 2018]**

If $f(x) = \frac{\sin x}{x}$, then $f(0-0)$ is :

(a) –2 (b) 2 (c) –1 (d) 1 **[Kanpur 2019]**

$\lim_{x \to 0} x \sin\left(\frac{1}{x}\right)$ is equal to :

(a) 0 (b) 1 (c) – 1 (d) ∞ **[Kanpur 2019]**

If f is continuous on the interval $[a,b]$, then :

(a) $f \in R\,[a, b]$ (b) $f \in Q\,[a, b]$ (c) $f \in I\,[a, b]$ (d) None of these

[Kanpur 2019]

. The function $f(x) = \begin{cases} x^2 & , \text{ where } x < 0 \\ 5x - 4, & \text{when } x \geq 0 \end{cases}$ is not continuous at :

(a) $x = 0$ (b) $x = 1$

(c) $x = 2$ (d) $x = 0$

[Kanpur 20

. The function $f(x) = \sin\left(\frac{1}{x}\right)$, at $x = 0$:

(a) Mixed discontinuity (b) Removable discontinuity

(c) Discontinuity of first kind (d) Discontinuity of second kind

[Kanpur 20

. The function $f(x)$ defined by $f(x) = \begin{cases} \dfrac{\tan(kx)}{x}, & x < 0 \\ 3x + 2k^2, & x \geq 0 \end{cases}$, will be continu

at $x = 0$, then non-zero value for the constant k is :

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$ [Kanpur 20

. The function $f(x) = \begin{cases} x^2 + 3x + a, & \text{if } x \leq 1 \\ bx + 2 & , \text{if } x > 1 \end{cases}$ is differentiable at $x = 1$, th

the value of a and b are :

(a) $a = 2, b = 3$ (b) $a = 5, b = 3$ (c) $a = -3, b = -5$ (d) $a = 3, b$

[Kanpur 20

. If f is a real function defined in the interval $[a, b]$ s. t. :

(i) f is continuous in $[a, b]$

(ii) f is differentiable in interval (a, b)

(iii) $f(a) = f(b); \exists c \in (a, b)$ s. t. $f'(c) = 0$

This statement in called :

(a) Rolle's theorem (b) Mean Value theorem

(c) Darboux theorem (d) None of these [Kanpur 2

The value of θ is .... if $f(x+h) = f(x) + hf'(x + \theta h), 0 < \theta < 1$, w

$f(x) = x^2$.

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$ [Kanpur

Use Cauchy's mean value theorem, then the value of $\lim_{x \to 1} \left[\dfrac{\cos\left(\frac{\pi x}{2}\right)}{\log_e(x)} \right]$

(a) π (b) $\frac{-\pi}{2}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{4}$

[Kanpur

The Lagrange's mean value theorem for the function $f(x) = x^3$ in $-2 \le x \le 2$, then value of 'c' is :

(a) $\pm\frac{2}{\sqrt{5}}$ (b) $\pm\frac{2}{\sqrt{7}}$ (c) $\pm\frac{2}{\sqrt{3}}$ (d) ± 2

[Kanpur 2019]

The function $f(x) = |x+2|$ is :

(a) continuous at $x = -2$ (b) discontinuous at $x = -2$

(c) differentiable at $x = -2$ (d) None of these **[Kanpur 2019]**

In the expansion of Taylor's theorem, Cauchy's form of remainder after n terms is :

(a) $\frac{h^n (1-\theta)^{n-1}}{(n-1)!} f^n (a+\theta h)$ (b) $h^n (1+\theta)^{n-1} f^n (a+\theta h)$

(c) $h^n \frac{(1-\theta)^n}{n!} f^n (a+\theta h)$ (d) $h^{n-1} \frac{(1+\theta)^n}{(n-1)!} f^{n-1} (a+\theta h)$

[Kanpur 2019]

The third degree terms in the expansion of $e^x \sin y$ in Taylors series in the neighbourhood of $(0, 0)$ is :

(a) $\dfrac{x^2 y}{2}$

(b) $\dfrac{y^3}{6}$

(c) $\dfrac{x^2 y}{2} - \dfrac{y^3}{6}$

(d) $\dfrac{x^3}{6} - \dfrac{y^3}{6}$.

The function :

$$f(x, y) = \begin{cases} \dfrac{1}{x^2 + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$$

(a) is uniformly continuous at origin.

(b) is continuous at origin.

(c) is discontinuous at origin.

(d) None of the above

[Kanpur 2018]

. The domain of the function $z = e^{-(x^2+y^2)}$ is :

(a) the whole xy-plane.

(b) the whole yz-plane.

(c) the whole zx-plane.

(d) the z-plane

[Kanpur 2018]

. The set $N(a, b) = \left\{(x, y) : \sqrt{\left\{(x-a)^2 + (y-b)^2\right\}} < \delta\right\}$ is called :

(a) deleted neighbourhood of the point (a, b).

(b) circular neighbourhood of the point (a, b).

(c) rectangular neighbourhood of the point (a, b).

(d) None of the above

[Kanpur 2018]

[Kanpur 2018]

The minimum value of the function $u = x^2 + y^2 + z^2 - xy + x - 2z$ is :

(a) $\frac{2}{3}$ (b) $-\frac{2}{3}$ (c) $\frac{8}{7}$ (d) $-\frac{4}{3}$.

The function $u = (x + y + z)^3 - 3(x + y + z) - 24xyz + a^3$ has it's maximum value at :

(a) $(1, 1, 1)$ (b) $(-1, 1, 1)$ (c) $(-1, -1, 1)$ (d) $(-1, -1, -1)$.

The function $u = axy^2z^3 - x^2y^2z^3 - xy^3z^3 - xy^2z^4$ has it's maximum value at:

(a) $\left(\frac{a}{7}, \frac{2a}{7}, \frac{3a}{7}\right)$ (b) $\left(\frac{2a}{7}, \frac{a}{7}, \frac{4a}{7}\right)$

(c) $\left(\frac{a}{7}, \frac{3a}{7}, \frac{5a}{7}\right)$ (d) none of these. **[Kanpur 2018]**

. For the rectangular parallelopipeds, the cube has :

(a) maximum surface (b) minimum surface

(c) neither maximum nor minimum surface

(d) none of these.

. The maximum value of the function $u = \sin x \cdot \sin y \cdot \sin z$, where x, y, z are the angles of a triangle, is :

~~(a)~~ $\frac{3\sqrt{3}}{8}$ (b) $\frac{3\sqrt{3}}{4}$ (c) $\frac{3\sqrt{3}}{16}$ (d) $\frac{1}{8}$. **[Kanpur 2019]**

). The volume of the greatest rectangular parallelopiped, inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ is :

(a) $\frac{4}{3}\pi abc$ (b) $8abc$ (c) $\frac{8abc}{3\sqrt{3}}$ (d) $\frac{8abc}{3}$.

If P_1 and P_2 are two partition of $[a, b]$ and $P_1 \subset P_2$, then :

(a) $\|P_2\| \le \|P_1\|$ (b) $\|P_2\| \ge \|P_1\|$ (c) $|P_2| = |P_1|$ (d) $|P_2| \ge |P_1|$

[Kanpur 2018]

The sup $\{L[P, f]\}$ where P is a partition of $[a, b]$ is called :

(a) Upper Riemann integral of f on $[a, b]$

(b) Lower Riemann integral of f on $[a, b]$

(c) Riemann integral (d) None of the above **[Kanpur 2018]**

If $f : [a, b] \to R$ is bounded function, then :

(a) $\underline{\int_a^b} f(x)\, dx \le \overline{\int_a^b} f(x)\, dx$ (b) $\underline{\int_a^b} f(x)\, dx \ge \overline{\int_a^b} f(x)\, dx$

(c) $\underline{\int_a^b} f(x)\, dx > \overline{\int_a^b} f(x)\, dx$ (d) None of the above

[Kanpur 2018]

Let $f(x) = x$ for $x \in [0, 1]$ and let $P = \left\{0, \frac{1}{3}, \frac{2}{3}, 1\right\}$ be a partition of $[0, 1]$, then $U(P, f)$ is :

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{2}$ **[Kanpur 2018]**

If f is defined on $[a, b]$ by $f(x) = k \ \forall x \in [a, b]$, where k is constant, then

$\int_a^b f(x)\, dx =$

(a) 0 (b) k (c) $k(b-a)$ (d) $(b-a)$

[Kanpur 2018]

If $f \in R[a, b]$, then :

(a) $\lim\limits_{n\to\infty} \sum\limits_{r=1}^{n} hf(a+rh) = \int_a^b f$, where $b - a = nh$

(b) $\lim\limits_{n\to\infty} \sum\limits_{r=1}^{n} hf(a-rh) = \int_a^b f$, where $b - a = nh$

(c) $\lim\limits_{n\to\infty} \sum\limits_{r=1}^{n} hf(a+rh) = -\int_a^b f$, where $b - a = nh$

(d) None of these

[Kanpur 2019]

Let $f \in R(a,b)$ and let f be continuous at $x = c \in (a,b)$. If $F(x) = \int_a^x f(t)\, dt, x \in (a,b)$, then $F'(c) = f(c)$.

This statement is called :

(a) First Fundamental theorem of Integral Calculus

(b) First Mean value theorem

(c) Second Mean value theorem

(d) None of these **[Kanpur 2019]**

. If f is continuous on $[a, b]$, then there exists a point $c \in (a,b)$ such that $\int_a^b f(x)dx = (b-a)f(c)$. This statement is called :

(a) First mean value theorem (b) Second mean value theorem

(c) Fundamental theorem of Integral Calculus

(d) None of these **[Kanpur 2019]**

. The value of $\int_0^2 [x]\, dx^2$ is :

(a) 1 (b) 2 (c) 3 (d) 4 **[Kanpur 2019]**

$\int_1^4 \frac{dx}{(x-1)(x-4)}$ is :

(a) a proper integral
(b) an improper integral of the first kind .
(c) an improper integral of the second kind.
(d) an improper integral of the third kind. [Kanpur 2018]

$\int_0^\infty \frac{\sin x}{x} dx$ is :

(a) convergent at $x = 0$ but divergent at $x = \infty$
(b) divergent
(c) convergent (d) None of the above [Kanpur 2018]

$\int_0^\infty \frac{1}{1+x^3} dx$ is :

(a) a proper integral
(b) an improper integral of the third kind
(c) an improper integral of the second kind
(d) an improper integral of the first kind [Kanpur 2019]

The improper integral $\int_0^1 \frac{1}{\sqrt{x}} dx$:

(a) is convergent and its value is 0
(b) is convergent and its value is 1
(c) is convergent and its value is 2
(d) None of these [Kanpur 2019]

The improper integral $\int_1^\infty \frac{1}{x^3} dx$:

(a) is convergent and its value is $\frac{1}{2}$

(b) is convergent and its value is $\frac{1}{3}$

(c) is convergent and its value is $\frac{1}{4}$

(d) None of these [Kanpur 2019]

The integral $\int_1^\infty \frac{1}{x^{\frac{1}{3}}\left(1+x^{\frac{1}{2}}\right)} dx$ for the μ test is :

(a) convergent (b) divergent
(c) oscillatory (d) None of these [Kanpur 2019]

The integral $\int_a^\infty \frac{\sin x}{x^n}\,dx, n > 0$:

(a) is convergent by Dirichlet's test

(b) is divergent by Dirichlet's test

(c) is convergent by Abel's test

(d) None of these

[Kanpur 2019]

Integral $\int_0^\infty \frac{\sin x}{x^4}\,dx$ is :

(a) absolutely divergent

(b) divergent

(c) absolutely convergent

(d) None of these

[Kanpur 2019]

Integral $\int_0^{\frac{\pi}{2}} \cos(2x)\log(\sin x)\,dx$:

(a) is convergent by Abel's test

(b) is divergent by μ-test

(c) is convergent by Dirichlet's test

(d) None of these

[Kanpur 2019]

In the usual metric space R, the derived set D(Q) of all rational numbers is :

(a) Q (b) Z (c) C (d) R

The triangle inequality in a metric space (X, d) holds equality sign, when three points (x, y), (y, z) and (z, x) are :

(a) collinear (b) non-collinear

(c) the vertices of triangle (d) None of these.

Let R denote the set of real numbers. The mapping $d : R \times R \to R$ defined by $d(x, y) = |x^2 - y^2|, \forall x, y \in R$ is a / an :

(a) Discrete metric on R (b) Usual metric on R

(c) Indiscrete metric on R^2 (d) Pseudo metric on R **[Kanpur 2018]**

Let R be the set of real numbers. The metric space (R^n, d) with the usual metric d' on R^n is called the :

(a) usual n-space (b) real n-space

(c) real Euclidean n-space (d) Frechet space **[Kanpur 2018]**

Let (R, d) be a metric space, where d is the usual metric on R. Let

$A = \{x \in R : 0 < x \leq 1\}$, then $d(0, A) =$

(a) 0 (b) 1 (c) –1 (d) None of the above

[Kanpur 2018]

Consider the metric space (R, d), where d is the usual metric on R. Let :

$$A = \left\{1, \frac{1}{3}, \frac{1}{5}, \ldots\ldots, \frac{1}{2n-1} \ldots\ldots\right\} \text{ and } B = \left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \ldots\ldots, \frac{1}{2n} \ldots\ldots\right\}$$

then $d(A, B) =$

(a) ∞ (b) $\frac{1}{3}$ (b) $\frac{1}{2}$ (d) 0 **[Kanpur 2018]**

Metrics $d(x, y)$ and $\dfrac{d(x, y)}{1 + d(x, y)}$ defined on a non-empty set X are :

(a) equivalent (b) reciprocal

(c) complementary (d) None of the above **[Kanpur 2018]**

In a metric space (X, d), which one of the following statements is true ?

(a) Every singleton set is open set.

(b) The empty set ϕ and the whole space X are closed.

(c) Every subset is neither open nor closed.

(d) None of the above is true. **[Kanpur 2018]**

Let R be the set of real numbers and d be the usual metric on R. The subset of R which is neighbourhood of '1' is :

(a) (0, 2) (b) (1, 2) (c) [1, 2] (d) None of the above

[Kanpur 2018]

In the usual metric space (R, d) the closure of the subset (0, 1) of R is :

(a) (0, 1) (b) (0, 1] (c) [0, 1] (d) All of the above

[Kanpur 2018]

In the usual metric space (R, d) the interior of the subset

$D = \left\{\frac{1}{n} : n \in N\right\}$ is :

(a) D (b) ϕ (c) $\{1\}$ (d) $D \cup \{0\}$

[Kanpur 2018]

Every metric space is :

(a) first countable (b) second countable

(c) separable (d) All of the above **[Kanpur 2018]**

Let X be a metric space and let A be a subset of X, then A is said to be dense in X, if :

(a) $A \subseteq D(A)$ (b) $(\overline{A})^0 = \phi$ (c) $\overline{A} = X$ (d) All of the above

. If R be the set of all real numbers and the functiion d defined by :

$$d(x, y) = \frac{|x-y|}{1+|x-y|}, \forall\, x, y \in R$$

then d is :

(a) a not metric for R (b) metric for Q

(c) a metric for R (d) None of these **[Kanpur 2019]**

3. If (X, d) be a metric space and $x, x', y, y' \in X$, then :

(a) $|d(x, y) + d(x', y')| \le d(x, x') + d(y, y')$

(b) $|d(x, y) - d(x', y')| \ge d(x, x') + d(y, y')$

(c) $|d(x, y) - d(x', y')| = d(x, x') - d(y, y')$

(d) $|d(x, y) - d(x', y')| \le d(x, x') + d(y, y')$ **[Kanpur 2019]**