MTH631 REAL ANALYSIS-II

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MCQ's

Q1) If $f(x) = \sin x$, then for $K \geq 0$

$$\| f^K(x) \|_{(-\infty,\infty)} =$$

* 1   * -1   * $(-1)^1$ * 0

Q2) By Stone and Weierstrass theorem, the trigonometric polynomials, are dense in $C[a,b]$ provided that

* $b-a < 2\pi$
* $b+a < 2\pi$ * $b-a > 2\pi$

Q3) The Fourier series of the function $f(x) = |x|$ always consists of ______ terms.

* Cosine   * Sine   * both Sine and Cosine
* None of these

Q4) Which of these functions is not uniformly continuous on $(0,1)$?

* x^2 * $\frac{1}{x^2}$ * $\frac{\sin x}{x}$ * $\sin x$

Q5) If $F_n = x^n$, $n \geq 1$, then ~~$\{F_n\}$~~ $\{F_n\}$ converges pointwise on

* $S = [0,1]$ * $S = [0,2]$, $S = [-1,1]$

Q6) The term-by-term integration of a uniformly convergent series of integrable functions is always
* permissible   * Not permissible
* Continuous   * None

(7) The singleton set is always
* disconnected   * polygonally connected
* Connected   * None

Q8) An open set S in R^n is connected if and only if it is ______
* disconnected   * polygonally connected
* polygonally disconnected   * None

Q9) For the function $f(x,y) = \frac{xy}{x^2+y^2}$, the limit of $f(x,y)$ as $(x,y) \to (0,0)$ along the line $y = x$ is ______
* $\frac{1}{2}$ * $-\frac{1}{2}$ * 0   * 1

Q10) The quotient of two continuous functions is a ______ function whenever the denominator is non-zero.
* differentiable   * Conti...

* composite * None of these

Q10) A vector valued function $G = (g_1, g_2, g_3 \text{ ——— } g_n)$ is said to be continuous if ——— is/are continuous

* any one of $g_i (1 \le i \le n)$
* all $g_i (1 \le i \le n)$
* some of $g_i (1 \le i \le n)$
* None of these

Q11) A function f is ——— on a subset S of R^n if S is contained in an open set on which $f_{x_1}, f_{x_2}, f_{x_3} \text{——} f_{x_n}$ are continuous

* Continuous differentiable
* uniformly convergent
* piecewise convergent
* None

Q12) For the function $f(x,y) = 3x^2y^3 + xy$ in two variables $f_{xy}(0,0) =$ ———

* 1
* −1
* 0
* None

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Q(14) If $f(x) = 3x + 5x^3$, then at $x = 1$,

$dy =$ ______

* 18dy   * 18dx   * 18

15) If value of a becomes zero in the Taylor series $\sum_{x=0}^{\infty} \frac{f^n(a)(x-a)^n}{n!}$, then the series is called ______

* Maclaurin series
* Fourier series
* Power series

16) If $p(X)$ is a homogeneous polynomial of degree r in $X - X_0$. If $p(X) \geq 0$ for all X, then p is called ______

* positive semidefinite
* positive definite
* negative semidefinite
* negative definite

Q17) An absolutely convergent integral is always

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* divergent * Convergent
* conditionally convergent

Q(18) If f is unbounded on the nondegenerate rectangle R in R^n, then ________

* f is not integrable on R
* f is integrable on R
* f is not differentiable on R

Q(19) If f is integrable on a Rectangle R, then ________

(a) $\overline{\int_R} f(x)\,dx > \underline{\int_R} f(x)\,dx = \int_R f(x)\,d(x)$

* $\overline{\int_R} f(x)\,dx = \underline{\int_R} f(x)\,dx = \int_R f(x)\,dx$

* $\overline{\int_R} f(x)\,dx > \underline{\int_R} f(x)\,d(x) > \int f(x)\,dx$

Q(20) If f is integrable on disjoint sets S_1 and S_2 then f is integrable on

* $S_1 \cup S_2$
* S_1 / S_2
* S_2 / S_1
* None

Q1) Define the radius of convergence of a power series $\sum_{n\geq 0}^{\infty} a_n (x-x_0)$

Also find the radius of convergence of the power series

$$\sum_{n\geq 1}^{\infty} \frac{n^n}{n!} (x+2)^n$$

Q2) Prove that $d(S) = d(\bar{S})$ for any set S in R^n.

Q3) Evaluate the integral

$$\int_0^{1/x} \left[p x^{p-1} \sin\frac{1}{x} - x^{p-2} \cos\frac{1}{x} \right] dx$$

for the values of p for which it converges

Q4) Let $h(r, \theta, \phi) = f(x, y, z)$ where $x = r \sin\phi \cos\theta$

$y = r\sin\phi \sin\theta$, $z = r\cos\phi$.

Find h_r, h_ϕ, h_θ in terms of f_x, f_y and f_z

(Q5) Define principal of nested sets. Further prove that a region S is always connected.

(Q6) Define the Riemann Sum and Riemann Integral in R^n.

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