Assignments

For

1ˢᵗ year students – 1ˢᵗ semester

By

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Student Name :   **B.N.**

Assignment 1

Determine if the following series is convergent or divergent.

$$\sum_{n=1}^{\infty}\frac{(-10)^n}{4^{2n+1}(n+1)}, \quad \sum_{n=1}^{\infty}\frac{n^n}{3^{(1+2n)}}, \quad \sum_{n=1}^{\infty}\frac{n}{n^2-\cos^2(n)}, \quad \sum_{n=1}^{\infty}n\,e^{n^2}$$

Solution

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Assignment 2

Find interval of convergence for the following series and determine the behavior of the series at the endpoints of the interval. State clearly where the series converges absolutely, where it converges conditionally, and where it diverges.

$$\sum_{n=1}^{\infty}\frac{(-1)^n}{(2n+1)!\,x^{2n+1}}\,,\qquad \sum_{n=1}^{\infty}\frac{(-1)^n\,x^n}{3^n\,(n!)^2}\,,\qquad \sum_{n=1}^{\infty}\frac{(-1)^{n+1}(x-2)^n}{n\,2^n}$$

Solution

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Assignment 3

Find Envelope of the following Curves

a) $f(x, y, t) = t^2 + t (y - x - k) + k x$, t is the parameter

b) $f(x, y, t) = \dfrac{x}{t} + \dfrac{y}{1-t} = 1$, t is the parameter

c) $f(x, y, t) = 3t^2 x - y - 2 t^3$

Solution

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Assignment 4

Find maximum and minimum values of

a) $f(x, y) = x + 2y$ subject to $x^2 + y^2 = 1$

b) $f(x, y, z) = x + y + z$ on the sphere $x^2 + y^2 + z^2 = 4$

c) $f(x, y) = x^2 - 4xy + y^2 + 4y$ is restricted to square whose vertices $(0, 0), (1, 0), (1, 1), (0, 1)$

Solution

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Assignment 5

1) Find minimal distance of the point (0, 0, -1) from the plane given by $z = 2x - y + 1$

2) Find the critical points and classify the following functions

$f(x, y) = 9 - 2x + 4y - x^2 - 4y^2$

Solution

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Assignment 6

1) Find Taylor Maclaurin series of the following functions

a) $f(x, y) = e^x \, Ln \, (1+ y),$

b) $f(x, y) = e^{x+y} \sin (xy),$

c) $f(x, y) = xy + \cosh(x+y),$

d) $f(x, y) = \tan^{-1}(\dfrac{x+y}{x-y})$

2) Repeat the expansion of above functions about $(1, 2)$

Solution

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Assignment 7

Solve the following Differential equations

1) $(x+2y)\,dx + (2x-y+1)\,dy = 0$

2) $(y + \ln(x))dx + (x+y^2)\,dy = 0$

3) $e^y + e^{-x}\,Lnx + (e^y + y^2\,e^{-x})y` = 0$

4) $2x\,y^2 + 4x^3 + 2(x^2 + 1)\,y\,y` = 0$

5) $y` = \dfrac{2x-3y+9}{6y-4x+1}$

6) $y` = y + y^3$

7) $y` = 1 + x + y + xy$

8) $y` + (\tan x)\,y = \cos^2 x$

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Solution

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Assignment 8

Solve the following Differential equations

(1) $y`` + 2y` + 2y = e^x \sin^2(2x)$          (2) $y`` + y = \sec(x)$

(3) $y``` + y`` - y` - y = e^x$          (4) $y`` + 5y` + 6y = 2-x+3x^2$

Solution

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Assignment 9

Find grad (div(curl $\vec{u}$) for the following vectors

a) $\vec{u} = (xy + z\tan x)i + x^2ye^zj - (y\sin(xz))k$

b) $\vec{u} = (xy\cos z + y^2z\tan x)i + ye^{zx}j - (xy\sin(z))k$

Solution

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Assignment **10**

Evaluate the following integrals

1- $\int\limits_{c} ydx + zdy + xdz$, c is the intersection of $x^2 + y^2 + z^2 = 2(x+y)$ and $x + y = 2$ (in the direction clockwise as viewed from the origin)

2- $\int\limits_{0}^{3} \int\limits_{\sqrt{x/3}}^{1} e^{y^3} dydx$

Solution

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