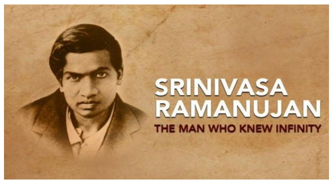
SRM Institute of Science and Technology
Kattankulathur

DEPARTMENT OF MATHEMATICS

18MAB101T CALCULUS & LINEAR ALGEBRA

UNIT-2 Functions of Several Variables



Sl.No.	Tutorial Sheet-1	Answers
	PART – B	
1	If $u = x^2y^3$, $x = \log t$, $y = e^t$, find $\frac{du}{dt}$	$\frac{e^{3t}\log t(2+3t\log t)}{t}$
2	If $u = \log\left(x^3+y^3+z^3-3xyz\right)$ then prove that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$	
3	If $z = f(x+ct)+\phi(x-ct)$, prove that $\frac{\partial^2 z}{\partial t^2} = c^2\frac{\partial^2 z}{\partial x^2}$	
4	If $f(x,y) = x^2\tan^{-1}\left(\frac{y}{x}\right)-y^2\tan^{-1}\left(\frac{x}{y}\right)$, verify $f_{xy} = f_{yx}$.	$f_{xy} = \frac{x^2-y^2}{x^2+y^2}$
5	Obtain the Maclaurin's series of $e^x\cos y$.	$1+x+\frac{1}{2}(x^2-y^2)+$ $+\frac{1}{6}(x^3-3xy^2)+\ldots$
	PART – C	
6	If $u = f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z} = 0$.	
7	Using Taylor's series, verify that, $\log(1+x+y) = (x+y)-\frac{1}{2}(x+y)^2+\frac{1}{3}(x+y)^3\ldots.$	
8	**Let $\phi = \phi(u,v)$ where $u = e^x\cos y$ and $v = e^x\sin y$, show that $v\frac{\partial\phi}{\partial x}+u\frac{\partial\phi}{\partial y} = (u^2+v^2)\frac{\partial\phi}{\partial v}$.**	
9	Find the expansion for $f(x,y) = \tan^{-1}(xy)$ and hence compute the value of $f(0.9,-1.2)$. Hint.: Use the point (1,-1) for the expansion.	-0.8229
10	Expand $e^x\sin y$ in power of x and y near the point $\left(-1,\frac{\pi}{4}\right)$ as far as the terms of the third degree. Ans.: $\frac{1}{e\sqrt{2}}\left\{1+(x+1)+\left(y-\frac{\pi}{4}\right)+\frac{1}{2}\left[(x+1)^2+2(x+1)\left(y-\frac{\pi}{4}\right)-\left(y-\frac{\pi}{4}\right)^2\right]+\ldots\right\}$	