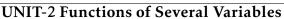


## SRM Institute of Science and Technology Kattankulathur

## DEPARTMENT OF MATHEMATICS 18MAB101T CALCULUS & LINEAR ALGEBRA





	ONTI-21 unctions of Several variables	
Sl.No.	Tutorial Sheet-1	Answers
	PART – B	
1	If $u = x^2 y^3$ , $x = \log t$ , $y = e^t$ , find $\frac{du}{dt}$	$\frac{e^{3t}\log t(2+3t\log t)}{t}$
2	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$ 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 $e^x \cos y$ .	$f_{xy} = \frac{x^2 - y^2}{x^2 + y^2}$ $1 + x + \frac{1}{2}(x^2 - y^2) + \dots$ $+ \frac{1}{6}(x^3 - 3xy^2) + \dots$
	PART – C	V
6	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ , prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$ .  Using Taylor's series, verify that,	
7	Using Taylor's series, verify that, $\log(1+x+y) = (x+y) - \frac{1}{2}(x+y)^2 + \frac{1}{3}(x+y)^3 \dots$	
8	Let $\phi = \phi(u, v)$ where $u = e^x \cos y$ and $v = e^x \sin y$ , show that $v \frac{\partial \phi}{\partial x} + u \frac{\partial \phi}{\partial y} = (u^2 + v^2) \frac{\partial \phi}{\partial y}$ .	
9	Find the expansion for $f(x,y) = \tan^{-1}(xy)$ and hence compute the value of $f(0.9, -1.2)$ .	0.8220
10	Hint.: Use the point $(1,-1)$ for the expansion. Expand $e^x \sin y$ in power of $x$ and $y$ near the point $\left(-1, \frac{\pi}{4}\right)$ as far as	-0.8229
	the terms of the third degree.  Ans.: $\frac{1}{e\sqrt{2}} \left\{ 1 + (x+1) + \left(y - \frac{\pi}{4}\right) + \frac{1}{2} \left[ (x+1)^2 + 2(x+1) \left(y - \frac{\pi}{4}\right) - \left(y - \frac{\pi}{4}\right)^2 \right] + \dots \right\}$	
	$\frac{1}{2} \left[ (x+1)^{-} + 2(x+1) \left( y - \frac{1}{4} \right) - \left( y - \frac{1}{4} \right) \right] + \dots $	