SRM Institute of Science and Technology
Kattankulathur
DEPARTMENT OF MATHEMATICS
18MAB101T CALCULUS & LINEAR ALGEBRA
UNIT-2 Functions of Several Variables

Sl.No.	Tutorial Sheet-3	Answers
	PART – B	
1	If $x = u(1-v), y = uv$ verify that $\frac{\partial(x,y)}{\partial(u,v)} \cdot \frac{\partial(u,v)}{\partial(x,y)} = 1$.	
2	If $u = x^2, v = y^2$ find $J = \frac{\partial(u,v)}{\partial(x,y)}$.	$J = 4xy$
3	If $x = r\cos\theta, y = r\sin\theta, z = z$ find $\frac{\partial(x,y,z)}{\partial(r,\theta,z)}$.	$J = r$
4	If $u = xyz, v = xy + yz + zx, w = x + y + z$ find $J = \left(\frac{\partial(u,v,w)}{\partial(x,y,z)}\right)$.	$J = (x-y)(y-z)(z-x)$
5	The temperature T at any point (x,y,z) in space is $T = 400xyz^2$. Find the highest temperature on the surface of the unit sphere $x^2 + y^2 + z^2 = 1$.	$50°C$
	PART – C	
6	If $x = r\cos\theta, y = r\sin\theta$ verify that $\frac{\partial(x,y)}{\partial(r,\theta)} \cdot \frac{\partial(r,\theta)}{\partial(x,y)} = 1$.	
7	If we transform from 3D-Cartesian co-ordinates (x,y,z) to spherical polar co-ordinates (r,θ,ϕ) show that $\frac{\partial(x,y,z)}{\partial(r,\theta,z)} = r^2\sin\theta$.	
8	Find the $J = \left(\frac{\partial(y_1,y_2,y_3)}{\partial(x_1,x_2,x_3)}\right)$ if $y_1 = \frac{x_2x_3}{x_1}; y_2 = \frac{x_1x_3}{x_2}; y_3 = \frac{x_2x_1}{x_3}$.	$J = 4$
9	Examine the functional dependence of the functions $u = y + z;\ v = x + 2z^2;\ w = x - 4yz - 2y^2$. If so find the relationship.	$J = 0,\ v - w = 2u^2$
10	Find the shortest and longest distance from the point $(1,2,-1)$ to the sphere $x^2 + y^2 + z^2 = 24$, using Lagrange's method of constrained maxima and minima.	$\sqrt{6}$ and $3\sqrt{6}$