Parul University

Faculty of Engineering & Technology

Department of Applied Sciences and Humanities

1st Year B.Tech Programme (All Branches)

Mathematics – 1 (303191101)

Assignment -2

Q-1	Do as directed: 1 .When we differentiate an expression with respect to one of a number of independent variables, we are engaged in: (a)Partial differentiation (b)Integration (c)Finding definite integrals (d)Total differentiation 2.For $f(x,y,z) = xe^{y}cosz$–z–8, $f_x(3,0,0) =$ ______ 3.For function $f(x,y) = x^2e^y, find\ all\ second\ order\ partial\ derivatives.$ 4.If $z = x\ siny + y\ cosx,$ prove that $\frac{\partial^2 z}{\partial x\partial y} = \frac{\partial^2 z}{\partial y\partial x}$ 5.Evaluate $f_{xxy}\ for\ f = x^3y^2$ at (-1,2) 6.Evaluate $\lim_{(x,y)\to(1,2)} \frac{x^2+y}{3x+y^2}.$ 7 Find $f_{xyyx} = 2x^3y^3 - 3x^2y$
Q-2	1. If $u = y^2e^{\frac{y}{x}} + x^2\tan^{-1}\left(\frac{x}{y}\right)$,show that $(i)x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2u$ $(ii)\text{x}^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x\partial y} + \text{y}^2\frac{\partial^2 u}{\partial y^2} = 2u$ 2. If $u = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then prove that $(i)x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}tanu$ $(ii)\ x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x\partial y} + \text{y}^2\frac{\partial^2 u}{\partial y^2} = \frac{1}{4}(tan^3u - tanu)$

Q-3	(a) If $x^y + y^x = c\ then$, find $\frac{dy}{dx}$. (b) If $ysinx = xcosy\ , find\ \frac{dy}{dx}$.
Q-4	(a) If $u = \tan^{-1}\left(\frac{y}{x}\right), x = e^t - e^{-t}, y = e^t + e^{-t}\ , find\ \frac{du}{dt}$. (b) If $z = e^{xy}, x = tcost, y = tsint\ , find\ \frac{dz}{dt}\ at\ t = \frac{\pi}{2}$
Q-5	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$
Q-6	Find the equations of tangent plane and normal line for the following functions. (a)Ellipsoid $\frac{x^2}{4} + \frac{y^2}{1} + \frac{z^2}{9} = 3$ at the point $(-2,1,-3)$ (b)Surface $z = 2x^2 + y^2$ at the point (1,1,3)
Q-7	Find the extreme values of the function $x^3 + y^3 - 63(x + y) + 12xy$.
Q-8	(a)Find the minimum values of x^2yz^3, subject to the condition $2x + y + 3z = a$ (b)Find the points on the surface $z^2 = xy + 1$ nearest to the origin.
Q-9	(a)Find the Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$ for $u = x^2 - y^2, v = 2xy$. (b) If $u = 2xy, v = x^2 - y^2$ and $x = rcos\theta, y = rsin\theta$ then, evaluate $\frac{\partial(u,v)}{\partial(r,\theta)}$.
Q-10	Expand $e^x \log(1 + y)$in powers of x and y upto second degree.