Hacettepe Univ. MAT 124-02-05 Midterm Exam 02.04.2018					
Surname :			Instructor :		Signature
Name :			Time :		
ID :			Duration : 90 *min.*		
5 questions, **2** pages					**100** points
1	2	3	4	5	

Q1 Let $\boldsymbol{f(x,y) = xy^2}$, $\boldsymbol{P = (1,3)}$ and $\mathbf{u = 3i + 2j}$.

(a)(10 p.) Find the direction in which $\boldsymbol{f}$ increases most rapidly at $\boldsymbol{P}$.

(b)(5 p.) Find the maximum rate of increase in $\boldsymbol{f}$ at $\boldsymbol{P}$.

(c)(5 p.) Find the derivative of $\boldsymbol{f}$ at $\boldsymbol{P}$ in the direction of $\mathbf{u}$.

Q2 (a)(10 p.) Using the Implicit Function Theorem show that $\mathbf{cos}(\boldsymbol{xz}) = \mathbf{sin}(\boldsymbol{y+z})$ can be solved for $\boldsymbol{z}$ as a function of $\boldsymbol{x}$ and $\boldsymbol{y}$ near $\boldsymbol{P = (1,0,\pi/4)}$.

(b)(10 p.) Using the item **(a)** and chain rule, find $\left(\frac{\partial z}{\partial x}\right)_y$.

Q3 (20 p.) Let the curve $\boldsymbol{C}$ be the intersection of the cylinder $\boldsymbol{x^2 + y^2 = 4}$ and paraboloid $\boldsymbol{z = x^2 + y^2}$. Find parametric equations for the tangent line of $\boldsymbol{C}$ at $\boldsymbol{P = (\sqrt{2}, \sqrt{2}, 4)}$.

Q4(20 p.) Classify critical points of $f(x, y) = x^2y + y^2 - 2xy$.

Q5(20 p.) Find absolute maximum and minimum values of $f(x, y) = x^2y + xy^2$ on triangular region T defined by $x \geq 0$, $y \geq 0$ and $x + y \leq 4$.