M E T U
Northern Cyprus Campus

Math 120	**Calculus for functions of several variables**	**II. Exam**	**20.04.2009**
Last Name: Name : Student No:	Dept./Sec. : Time : 17: 40 Duration : 120 *minutes*	Signature	
7 QUESTIONS ON 4 PAGES		TOTAL 100 POINTS	

1	2	3	4	5	6	7			

Q1 (15=8+7 pts.) **(a)** Find the plane through the points $(3, 0, 0), (0, 1, 2), (0, 0, 1)$

(b) Find the line through the origin $(0, 0, 0)$ perpendicular to the plane $2x + 3y - z = 16$.

Q2 (15 pts.) Sketch the graph of the quadric surface $(x-1)^2 + 5y^2 = 2z$.

Q3 (10 pts.) Find the parametric equations of the tangent line to a space curve

$$x = t^3, \quad y = 1 + t, \quad z = 2t$$

at the point $(-1, 0, -2)$.

Q4 (15=7+8 pts.) Find the following limits if they exist. Explain your answers.

(a) $\lim_{(x,y)\to(0,0)} \dfrac{xy}{x^2+y^2+1}$

(b) $\lim_{(x,y)\to(0,0)} \dfrac{x^3y}{x^4+y^4}$

Q5 (15=7+8 pts.) Consider the function $f(x, y) = xy^3 + x^2$.

(a) Find the tangent plane to the graph of the function $f(x, y)$ at the point $(1, 3)$.

(b) Use the tangent plane appoximation to estimate the value $f(1.1, 2.9)$.

Q6 (15 pts.) Use the Chain Rule to find the partial derivative $\dfrac{\partial f}{\partial s}$ if $f(x, y, z) = z \ln\left(x + y^2 + z^3\right)$ and $x = 3t - s$, $y = t + 2s$, $z = ts$.

Q7 (15 pts.) Let $\mathbf{r}(t) = \langle f(t), g(t), h(t) \rangle$ be a vector-valued funtion such that $\mathbf{r}(t) = \mathbf{r}'''(t)$ for all t. Show that the triple (or box)-product $a(t) = \mathbf{r}(t) \cdot (\mathbf{r}'(t) \times \mathbf{r}''(t))$ is a constant function. (*Hint: consider the derivative* $a'(t)$)