EXAM 3 - MATH 251 Friday, March 22

YOUR NAME:_____ George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Consider the vector function $\mathbf{r}(t) = \langle t \sin t, t \cos t, 3t \rangle$. Compute the following vectors:

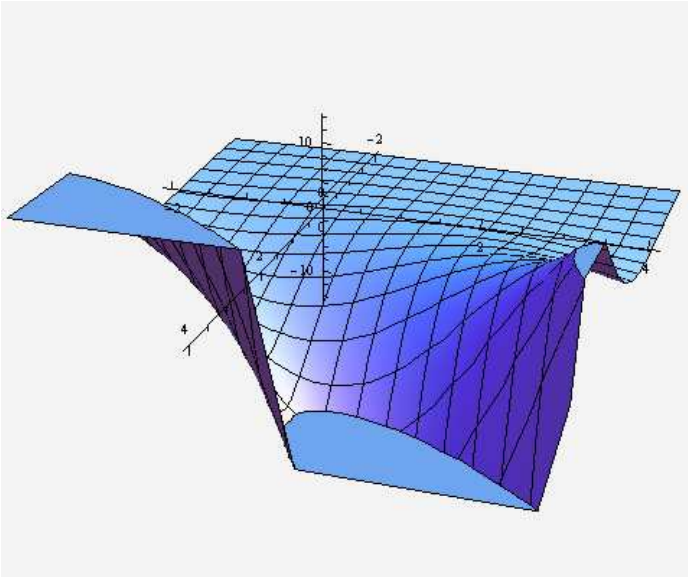
   (a) $\mathbf{T}(\pi)$

   (b) Find an equation for the normal plane at $t = \pi$.

2. Find the first-order partial derivatives of the function $f(x, y) = \dfrac{xy^2}{x^2 + y^2}$. Please, use correct notation. Do not let me guess what you are computing.

3. Find all second-order partial derivatives of the function $f(x, y) = e^{-x} \sin y$. Please, use correct notation. Do not let me guess what you are computing.

4. Find an equation for the tangent plane to the surface $f(x, y) = e^{x} \sin(y - x)$ at the point $(1, 1, 0)$.



5. A moving object has position vector $\mathbf{r}(t) = e^t\mathbf{i} + \sqrt{2}t\mathbf{j} + e^{-t}\mathbf{k}$. Find the tangential and the normal components of its acceleration vector. (This may take some time since it involves some algebra.)