Midterm 1 / 2003.10.15 / Calculus for Applications / MAT 3243

Name: _____

Please show all work and justify your statements. Make and label sketches, draw conclusions (using complete sentences and including units), and box your final answers as appropriate.

1. A surface in $\mathbf{R}^3$ is given by $xy + \cos(yz) = 1$. Find an equation for the plane tangent to this surface at $(1, 0, 1)$.

2. Find a parametric formula for the line tangent to the path (t, t^2, t^3) at $(1, 1, 1)$.

3. Compute the length of the path $(\cos(2t), \sin(2t), t^{\frac{3}{2}})$, $0 \leq t \leq 1$.

4. Compute the curl and the divergence of the vector field $(x + yz, y + xz, z + xy)$.

5. Compute the double integral of $xe^y \, dy \, dx$ over the rectangle $-2 \leq x \leq 4$, $0 \leq y \leq 1$.

6. A kid is sucking on a cylindrical popsicle with radius 2 cm and height 4 cm. If the radius is shrinking at the rate of 0.1 cm/s and the height at the rate of 0.2 cm/s, how fast is the popsicle being consumed? (i.e. how fast is the volume decreasing?)

1	2	3	4	5	6	total (60)	%

Prelim. course grade: %