## Math 042

Review for Midterm 1.

1. Find the $u_{x}(1,1), u_{y}(1,1)$ if $x \sin u(x, y)+y(u(x, y))^{2}=x^{2}-1$ and $u(1,1)=0$.
2. Plot level curves for the function $z=f(x, y)=4 x^{2}-y^{2}$. Plot the level surfaces of the function $f(x, y, z)=x^{2}+y^{2}+4 z^{2}$.
3. If a kid blows a balloon at 2 in $^{3}$ per second. Find the rate of change of the volume if you assume the balloon always assume the shape of a ball.
4.Find the directional derivative of $f(x, y, z)=x^{2}+2 x y+4 y z$ in the direction of $i+j+k$.

What is physical meaning of this derivative?
5. Compute: $\left(x^{y^{2}+z x}\right)_{x}$ and $\left(x^{y^{2}+z x}\right)_{x y}$.
6. Find tangent, normal vector and curvature of the curve: $t \mathbf{i}+t \mathbf{j}+t^{2} \mathbf{k}$.
7. A particle's acceleration is according to $a(t)=t \mathbf{i}-t \mathbf{j}+t^{2} \mathbf{k}$. Find all its possible vector-valued position function.
8. Find parameterizations of the curves

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x^{2}+5 y^{2}=8
$$

9. Give a function so that it is continuos at $(0,0)$ by not differentiable. Give a function so that it isn't continuous at $(0,0)$.
10. Find tangent line of the curve defined as $x+\sin (x+y-2)=x-y+2$, at the point $(0,2)$.
