Math 2153, Quiz #5, Fall 2012 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round.

1. Sketch at least 5 level curves of the graph $z = x^2 + 2y^2$. Sketch or describe the three-dimensional function based on those level curves.

$z=0$

$x^2+2y^2=0$

$z=1$

$x^2+2y^2=1$

$x^2+\frac{y^2}{(1/2)}=1$

$z=2$

$x^2+2y^2=2$

$\frac{x^2}{2}+y^2=1$

$z=3$

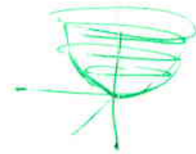
$x^2+2y^2=3$

$\frac{x^2}{3}+\frac{y^2}{(3/2)}=1$

$z=4$

$x^2+2y^2=4$

$\frac{x^2}{4}+\frac{y^2}{2}=1$



elliptic paraboloid

2. Find the limit, if it exists, or prove that it does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^3}$$

$x^2=y^3$

$x^{2/3}=y$

$x=0$

$\lim_{y\to 0} \frac{0}{y^3}=0$

DNE

$y=kx^{2/3}$

$$\lim_{x\to 0} \frac{x\cdot kx^{2/3}}{x^2+(kx^{2/3})^3} = \lim_{x\to 0} \frac{x^{5/3}\cdot k}{x^2(1+k^3)} = \lim_{x\to 0} \frac{k}{x^{1/3}(1+k^3)} = \pm\infty$$

3. Find all first partial derivatives of $f(x,y,z) = xy^2 \sinh(xy) \ln(z+e^z)$.

$$\frac{\partial f}{\partial x} = \ln(z+e^z)\left[y^2\sinh(xy) + xy^2\cosh(xy)\cdot y\right]$$

$$\frac{\partial f}{\partial y} = \ln(z+e^z)\left[2xy\sinh(xy) + xy^2\cosh(xy)\cdot x\right]$$

$$\frac{\partial f}{\partial z} = xy^2\sinh(xy)\cdot\frac{1}{z+e^z}\cdot(1+e^z)$$