Homework Assignment for Week 08

1. Show that if $f(x,y) = o(1)\cdot|x-x_0| + o(1)\cdot|y-y_0|$ as $(x,y)\to(x_0,y_0)$ then $f(x,y) = o(1)\cdot\sqrt{(x-x_0)^2+(y-y_0)^2}$ and vice versa (the converse). Note that all three $o(1)$ refer to $2D$ limits as $(x,y)\to(x_0,y_0)$.

   Hint: $\sqrt{\Delta x^2+\Delta y^2} = \frac{\Delta x}{\sqrt{\Delta x^2+\Delta y^2}}\Delta x + \frac{\Delta y}{\sqrt{\Delta x^2+\Delta y^2}}\Delta y$

2. Section 14.4: Problems 7, 29, 31, 43, 51.

3. Suppose that $F(x,y,z)=0$ can implicitly define $x=f(y,z)$, or $y=g(z,x)$, or $z=h(x,y)$ near some point (x_0,y_0,z_0) with $F(x_0,y_0,z_0)=0$. (for example, $F(x,y,z)=x+2y+3z-4$ can). Show that, for any such point (x_0,y_0,z_0), we have

$$\frac{\partial f}{\partial y}\frac{\partial g}{\partial z}\frac{\partial h}{\partial x} = \frac{\partial f}{\partial z}\frac{\partial g}{\partial x}\frac{\partial h}{\partial y} = -1$$

4. Section 14.5: Problems 9, 15, 19, 25, 29, 35.

   (Do as many as you can, we will go through the rest on Tuesday)