HW 3
Math 261

Please see the course syllabus for details on how to turn in your homework assignments.

1. (5 pts.) True or False
   (a) Let $h(x,y)$ be a continuous function. Then for any poiny (x_0,y_0) in the domain of h, the limit of h as (x,y) approach the point (x_0,y_0) exists.
   (b) Let $h(x,y)=x/y$. The limit of h as (x,y) approach the point $(1,1)$ exists.
   (c) Let $h(x,y)=x/y$. The limit of h as (x,y) approach the point $(0,0)$ exists.
   (d) Let $h(x,y)=\begin{cases} 3 & (x,y)=(0,0) \\ 1 & (x,y)\neq(0,0) \end{cases}$. The limit of h as (x,y) approach the point $(0,0)$ doesn't exist.
   (e) Let $h(x,y)=\begin{cases} 3 & (x,y)=(0,0) \\ 1 & (x,y)\neq(0,0) \end{cases}$. The limit of h as (x,y) approach the point $(0,0)$ is equal to 3.
2. (3 pts.) If $f(x,y,z)=\sqrt{x^3+\sin(y)-y\ln(z)}$, find $f(2,\frac{\pi}{2},1)$. Perform elementary simplifications.

3. (3 pts.) Sketch the domain of $g(x,y)=\ln(1-2x-2y)$.

4. (3 pts.) Let $h(x,y,z)=3x^2z+z\cos(\pi y-\pi x)+3e^z$. Determine $\lim_{(x,y,z)\to(1,2,0)} h(x,y,z)$.

5. (3 pts.) The function $k(x,y)=\dfrac{7x^8y}{-2x^9+9y^9}$ has no limit as $(x,y)\to(0,0)$.

   Show this by computing the limit of the function along the two following paths:
   (a) $t\mapsto(t,0)$. This notation indicates the path $(x(t),y(t))=(t,0)$, or equivalently, the path given by $y=0$.
   (b) $t\mapsto(t,t)$. This notation indicates the path $(x(t),y(t))=(t,t)$, or equivalently, the path given by $y=x$.

   Note (and hint): the nice thing about the parametric notation for the paths $t\mapsto(f(t),g(t))$ is that it suggests what you should do to compute the limit along the path: plug in the function $f(t)$ for x, the function $g(t)$ for y, and then take the limit as $t\to 0$.

6. (3 pts.) Compute $\dfrac{\partial h}{\partial x}$ for the function in #4.