Worksheet for September 5

Problems marked with an asterisk are to be placed in your math diary.

(1.*) Use the limit definitions to calculate $f_x(2-1), f_y(2,-1)$, for $f(x,y) = 3xy^2 + 2x^2y + 7$.

(2*.) Calculate the four partial derivatives of $f(x,y,z,w) = xy^2z^3w^4 3e^{xyzw} + \sin(x^2 + 3zw + 4y)$.

(3*.) For $f(x,y) = \begin{cases} \frac{xy}{x^2+y^2}, \text{ if } (x,y) \neq (0,0) \\ 0, \text{ if } (x,y) = (0,0) \end{cases}$, find a formula for $f_x(x,y)$ and determine if $f_x(x,y)$ is continuous at (0,0). Similarly for $f_y(x,y)$.

(4.) Consider $f(x,y) = 3 - x^2 - y^2$. Find the equation of the line tangent at $(1,3,f(1,3))$ to the curve obtained by intersecting the graphs $z = f(x,y)$ and $y = 3$. Note, this line lives in the plane $y = 3$ and the equation should initially be an equation in x and z. Then replacing x by t, find the vector equation for this line. Recall that if P is a point in $\mathbb{R}^3$ and $\vec{D}$ is a vector in $\mathbb{R}^3$, then the vector equation of the line through P in the direction of $\vec{D}$ is given by $L(t) = P + t \cdot \vec{D}$.