LECTURE 13: DIRECTIONAL DERIVATIVES AND PARTIAL DIFFERENTIATION

pgs. 149 – 157 (Def^{n}'s and basic examples)

pgs. 158 – 162 (Discussion of Continuously Diff. and how directional derivative is connected to partial derivatives through $\nabla f = \left\langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y} \right\rangle$)

$$f_x(x_0, y_0) = \frac{\partial f}{\partial x}(x_0, y_0) = \lim_{h \to 0} \left[\frac{f(x_0 + h, y_0) - \overset{f(x_0, y_0)}{\downarrow}}{h} \right] = \frac{d}{dt}\left[f(t, y_0) \right] \Big|_{t = x_0}$$

$$f_y(x_0, y_0) = \frac{\partial f}{\partial y}(x_0, y_0) = \lim_{h \to 0} \left[\frac{f(x_0, y_0 + h) - f(x_0, y_0)}{h} \right] = \frac{d}{dt}\left[f(x_0, t) \right] \Big|_{t = y_0}$$

$$f_{xy} = (f_x)_y = \partial_y(\partial_x f) = \partial_x(\partial_y f) = (f_y)_x = f_{yx}$$