11.16.22

LECTURE 37

DEFINITION

f is differentiable at x_0 if the following limit exists:

$$\lim_{x \to x_0} \frac{f(x) - f(x_0)}{x - x_0}$$

this is considered $f'(x_0)$

also, there exists a number m and a function $\varepsilon(x)$ such that

$$f(x) - f(x_0) = m(x - x_0) + \varepsilon(x)(x - x_0)$$

we can expand this notion of diffrentiability to 2 variables by considering tangent planes instead of tangent lines to the function

DEFINITION

If f is a function of two variables defined on an open disk w/ center (x_0, y_0). f is differientiable if:

$$f(x,y) - f(x_0,y_0) = \underbrace{f_x(x_0,y_0) \cdot (x - x_0) + f_y(x_0,y_0) \cdot (y - y_0)}_{\text{Plane passing through } (x_0, y_0, f(x_0,y_0))} + \varepsilon_1(x,y) \cdot (x - x_0) + \varepsilon_2(x,y) \cdot (y - y_0)$$

THEOREM

If f has first-order partials @ each pt. in a disk centered @ (x_0, y_0), and if these partials are continuous @ (x_0, y_0), then f is differentiable at (x_0, y_0)

Lesson 37 Problems

1) D 2) D 3) C