Teaching Assitant

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Office hours:

Wednesday / Friday 11:45 AM - 12:45 PM
McHenry Library Cafe

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Reflection

Take a moment to think about what was covered last class and what is due on upcomming assignments. Which concepts, techniques, etc. feel clear and doable? Which, if any, could use more explanation or practice?

Warm Up

You Are What You Eat

A function, $f : A \to B$, is a machine which eats objects from A and returns objects in B. If we want to understand a space A, a good place to start is to look at how different functions behave on that space.

Example

The derivative eats a function and a point and returns a real number.

$$\frac{d}{dx}(f)(p) = c.$$

In groups, try to complete the following:

- The integral eats a _______ and an _______ and returns a real number.
- The gradient eats a _____ and returns a _____.
- The directional derivative eats a function, a _____ and a ____ and returns a _________.
- The same can be done for dot products, cross products, integrals of vector valued functions, etc.

Problems 1, 2, and 3 (Gradients)

Problem 1 (10.6.8)

Let $f(x,y,z) = xy + yz^2 + xz^3$. Compute the gradient $\nabla f(5,-5,3)$ and the directional derivative $\nabla_u f(5,-5,3)$ in the direction $u = \left\langle -\frac{2}{\sqrt{38}}, -\frac{5}{\sqrt{38}}, -\frac{3}{\sqrt{38}} \right\rangle$.

Problem 2 (10.6.5)

The temperature in degrees Celsius at a point is given by

$$T(x,y,z) = 200e^{-x^2-y^2/4-z^2/9}.$$

Find the rate of change in temperature at point $(-1,1,1)$ in the direction of the point $(3,-3,5)$.
In which direction (unit vector) does temperature increase fastest, and what is the maximum rate of change?

Proble 3 (10.6.12)

Find all directions in which the directional derivative of $f(x,y) = ye^{-xy}$ is 1 at the point $(0,2)$.

Attendance