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10. Practice in higher dimensions

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Reflect

When prompted by the following video, you may try to pause and answer the questions yourself.

Note that this video prompts you to attempt to compute the directional derivative for functions of more than two variables! We encourage you to give it a try and then watch and see how it works. The questions are in the text below for your convenience.

For each of the following functions

- Compute the gradient,
- Evaluate it at the point P,
- Compute the directional derivative at P in the direction $\vec{v}$.

1. $f(x,y) = x^2y + xy^2$, $P = (-1,2)$, $\vec{v} = \langle 3,4 \rangle$.
2. $g(x,y,z) = \sqrt{x^2+y^2+z^2}$, $P = (2,6,-3)$, $\vec{v} = \langle 1,1,1 \rangle$.
3. $h(w,x,y,z) = wx + wy + wz + xy + xz + yz$, $P = (2,0,-1,-1)$, $\vec{v} = \langle 1,-1,1,-1 \rangle$.

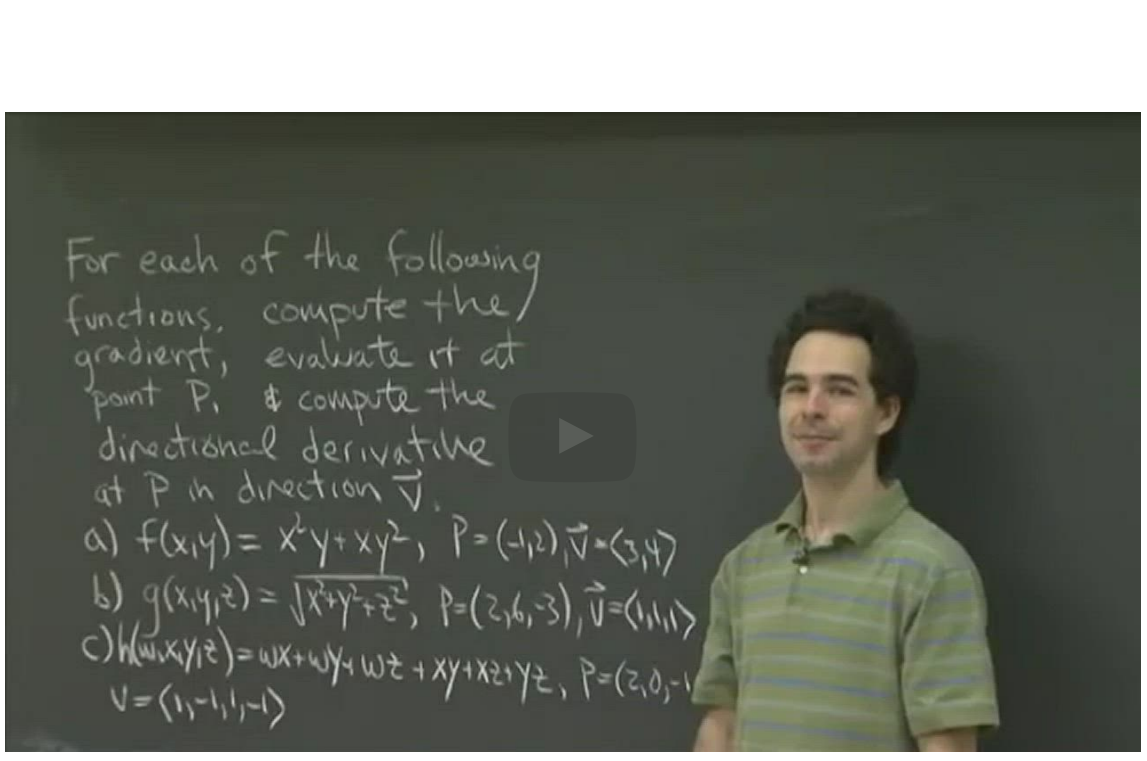
Please note that in the solutions, the recitation video uses yet another notation that we have not introduced, but means directional derivative. The notation used is for the directional derivative in the direction $\vec{v}$ is

$$\left.\frac{\partial f}{\partial s}\right|_{\vec{v}}$$

This notation is not introduced because we have not introduced the notion of ∂s.

Practice video

Start of transcript. Skip to the end.



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PROFESSOR: Hi.

Welcome back to recitation.

In lecture, you've learned about gradients and about

directional derivatives, so I have a problem here

to test your understanding of those objects

and give you some practice computing them.

Video Transcripts

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