



Math 20A lecture 16
Know which way the wind blows...

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Announcements

- ⑥ Homework eight due Friday
- ⑥ Office hours are 2–3.30pm today
- ⑥ See the website for all sorts of course-related fun
<http://people.brandeis.edu/~tbl/math20a/>
- ⑥ It is *your responsibility* to log into LATTE and check that the grades are entered correctly. So far, HW 1–5 should be posted.

Previously on math 20a

- ⑥ We've learned how to think about:
 - △ Functions which input a number t and return a number $f(t)$.
 - △ Functions which input a number t and return a vector/point in space $\mathbf{r}(t)$ (or $\mathbf{r}'(t)$).
 - △ Functions which input a point (x, y) in 2D space and return a number $f(x, y)$.
 - △ Functions which input a point (x, y, z) in 3D space and return a number $f(x, y, z)$.

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- ⑥ And, I said that going much further was going to be pretty impossible to visualize
- ⑥ I lied.

Where do vector fields come up



- ⑥ Wind patterns
- ⑥ Ocean current patterns
- ⑥ Aerodynamics (e.g. flow over airplane wings)
- ⑥ ...and fluid dynamics more generally
- ⑥ Force fields
- ⑥ Gravitational, magnetic...

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- ⑥ Magnetohydrodynamics

Example: finding the gradient vector field

Find the gradient vector field of the function

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- ⑥ We just take the partial derivatives:

$$f_x = e^y$$

$$f_y = xe^y$$

- ⑥ ...and combine them together to make a single vector function

$$(\nabla f) = \langle e^y, xe^y \rangle$$