Announcements

- Homework 1
  - Due on Monday night
  - Please start each problem on a new page
  - Please when you upload to Gradescope accurately tie which pages correspond to which questions
  - I'll grade 2 randomly
  - 14 *cumulative* late days before late = 50%
- Bring your laptop on Friday and make sure it is capable of opening Jupyter notebooks
- Friday Reading: Ch 1, Section 4
- Question Responses: rembold-class.ddns.net

The following mathematical operation makes sense and is technically valid.

$$\nabla \cdot \nabla T(x, y, z)$$

A. Yes, it will produce a vector field
B. Yes, it will produce a scalar field
C. No, you can't take the divergence of a scalar field
D. No, but for a completely different reason

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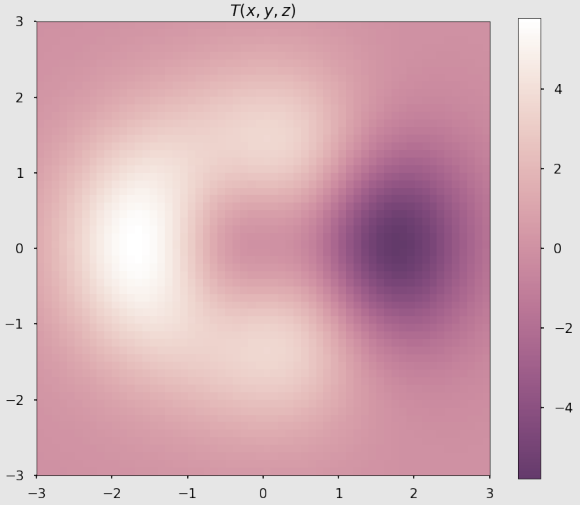
What would be the physical significance of this operation? Say I did this operation at some point in space and got a large positive value. What would that indicate?

Interpretations



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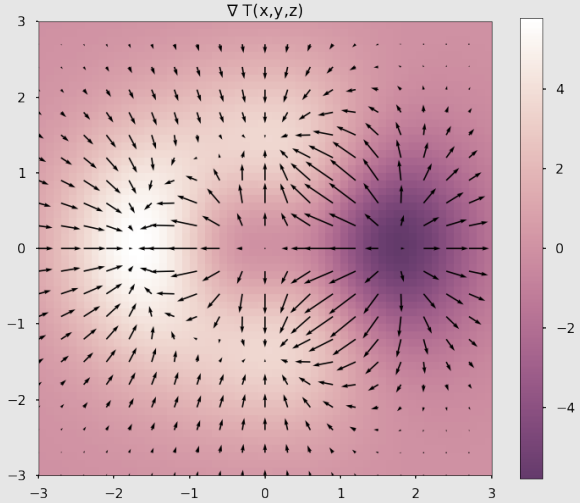

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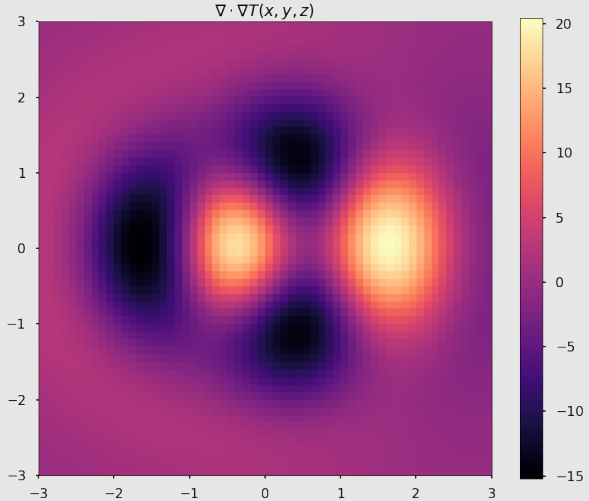

You are trying to compute the work done by a force, $\vec{\mathbf{F}} = a\hat{\mathbf{x}} + x\hat{\mathbf{y}}$, along the line $y = 2x$ from (0,0) to (1,2). What would be the value of $d\vec{\ell}$?

A. $dx\hat{\mathbf{x}}$
B. $dy\hat{\mathbf{y}}$
C. $2dx\hat{\mathbf{x}}$
D. Something else

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1. $\int_0^1 a\,dx + \int_0^2 x\,dy$
2. $\int_0^1 (a\,dx + 2x\,dx)$,
3. $\frac{1}{2}\int_0^2 (a\,dy + y\,dy)$

A. Both 1 and 2
B. Both 2 and 3
C. Both 1 and 3
D. All 3 are correct

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Suppose a fluid has a velocity field given by $\vec{\mathbf{v}} = x\hat{\mathbf{x}} + z\hat{\mathbf{y}}$. Which components of the field contribute to the "fluid flux" integral ($\int_S \vec{\mathbf{v}} \cdot d\vec{\mathbf{A}}$) through the x-z plane?

A. v_x
B. v_y
C. Both contribute
D. Neither contribute

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A. It is zero
B. It is something finite
C. It is infinite
D. I don't have time to do this integral

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Evaluate the following line integral where $T(x, y) = xy + \frac{5}{x}$:

$$\int_{(1,2)}^{(5,1)} (\boldsymbol{\nabla} T) \cdot d\vec{\ell}$$

A. -26
B. -1
C. 20
D. I can't solve this without knowing a path

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Which of the following two fields has zero divergence?

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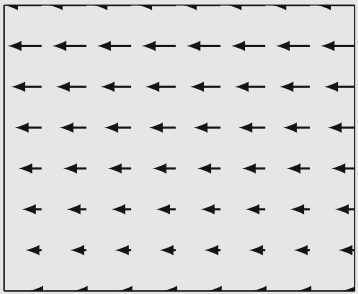

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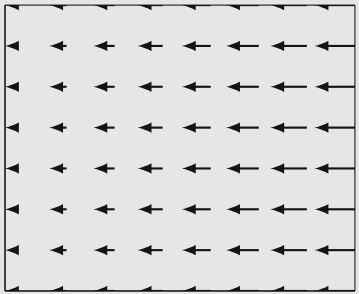

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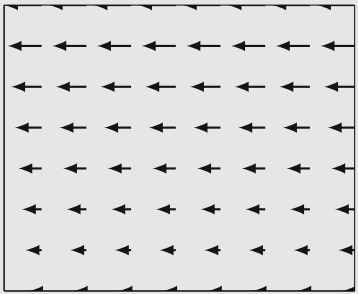

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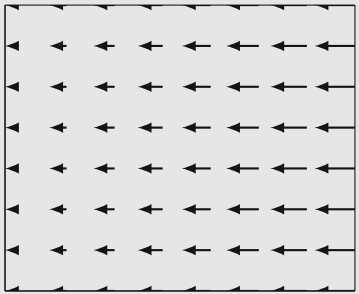

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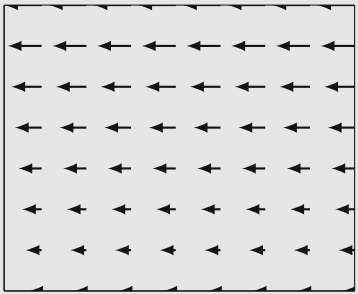

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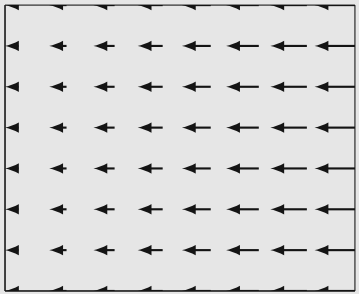

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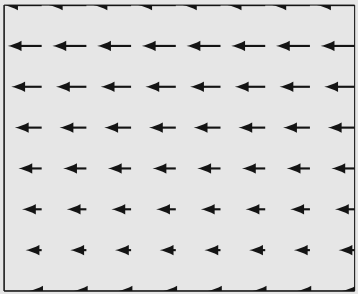

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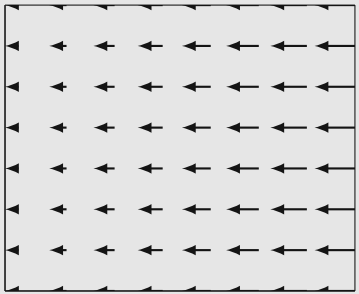

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