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5. Find a normal vector

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Problem Set A due Aug 18, 2021 20:30 IST Completed

2A-7

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Find a unit vector \hat{u} that is normal to the line segment from $(1, 0)$ to $(3, 3)$.

$\hat{u} =$

✔ Answer: [3/sqrt(13),-2/sqrt(13)]

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Solution:

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The direction of the line segment is $(3, 3) - (1, 0) = (2, 3)$. Hence a normal vector to the line segment is $\langle 3, -2 \rangle$. Notice that $\langle 3, -2 \rangle$ is not a unit vector, but we can divide it by its length to obtain

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$$\hat{u} = \frac{1}{\sqrt{3^2 + 2^2}} \langle 3, -2 \rangle = \left\langle \frac{3}{\sqrt{13}}, -\frac{2}{\sqrt{13}} \right\rangle.$$

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We could also have chosen $\langle -3, 2 \rangle$ as a normal vector. Then the corresponding unit normal vector would be

$$\hat{u} = \left\langle -\frac{3}{\sqrt{13}}, \frac{2}{\sqrt{13}} \right\rangle.$$

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