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1. Parallel and perpendicular vectors

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Recitation due Aug 18, 2021 20:30 IST Completed

Practice

Perpendicular vectors practice 1

2.0/2 points (graded)
Find a vector in the same direction as $\langle 3, 2\rangle$ with length 1.

(Type vectors surrounded by square brackets; e.g. type `[a,b]` for the vector $\langle a, b\rangle$.)

[3/sqrt(13),2/sqrt(13)] ✔ **Answer:** [3,2]*(1/sqrt(13))

Find a nonzero vector perpendicular to $\langle 3, 2\rangle$.

(Type vectors surrounded by square brackets; e.g. type `[a,b]` for the vector $\langle a, b\rangle$.)

[-2/sqrt(13),3/sqrt(13)] ✔ **Answer:** [2,-3]

Solution:

We want to find a vector $\lambda\langle 3, 2\rangle$ that has length 1. To find λ, we solve the equation

$$\lambda\langle 3, 2\rangle \cdot \lambda\langle 3, 2\rangle = \lambda^2 \left(3^2 + 2^2\right) = \lambda^2 13 = 1.$$

Therefore $\lambda = 1/\sqrt{13}$, and the vector we are looking for is $\dfrac{\langle 3, 2\rangle}{|\langle 3, 2\rangle|} = \dfrac{1}{\sqrt{13}}\langle 3, 2\rangle$.

Submit You have used 1 of 15 attempts

Answers are displayed within the problem

Perpendicular vectors practice 2

3.0/3 points (graded)
L is the line $2x - y = 1$.

- Find a nonzero vector perpendicular to L.

  (Type vectors surrounded by square brackets; e.g. type `[a,b]` for the vector $\langle a, b\rangle$.)

  [2,-1] ✔ **Answer:** [2,-1]

- Find a vector parallel to L.

  (Type vectors surrounded by square brackets; e.g. type `[a,b]` for the vector $\langle a, b\rangle$.)

  [1,2] ✔ **Answer:** [1,2]

- Find a unit vector perpendicular to L.

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Find a unit vector perpendicular to $\boldsymbol{L}$.

(Type vectors surrounded by square brackets; e.g. type `[a,b]` for the vector $\langle a, b \rangle$.)

[2/sqrt(5),-1/sqrt(5)] ✔ **Answer:** [2/sqrt(5),-1/sqrt(5)]

Solution:

- The vector $\langle 2, -1 \rangle$ (or any nonzero multiple of it) is normal to the line $2x - y = 1$.
- To find a vector normal to $\langle 2, -1 \rangle$, we create a vector by switching the components, and taking the negative of one component. This gives us the vector $\langle 1, 2 \rangle$. We check that this is normal by taking the dot product

$$\langle 2, -1 \rangle \cdot \langle 1, 2 \rangle = 2\,(1) - (1)\,(2) = 0.$$

- A unit vector perpendicular to $\boldsymbol{L}$ is any vector that points in the same (or opposite) direction as $\langle 2, -1 \rangle$ and has unit length. To make any vector unit length, we divide it by its magnitude $\hat{v} = \dfrac{\vec{v}}{|\vec{v}|}$. The magnitude of our perpendicular vector is

$$|\langle 2, -1 \rangle| = \sqrt{2^2 + (-1)^2} = \sqrt{5}.$$

Therefore the unit length vector normal to the given line is $\langle 2/\sqrt{5}, -1/\sqrt{5} \rangle$.

Submit You have used 1 of 15 attempts

Answers are displayed within the problem

1. Parallel and perpendicular vectors

Topic: Unit 2: Geometry of Derivatives / 1. Parallel and perpendicular vectors

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? Find a vector parallel to L
isn't the parallel vector scalar product of the [2,-1]? 2

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