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**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  $\lambda(3,2)$  that has length 1. To find  $\lambda$ , we solve the equation

$$\lambda\langle 3,2
angle \cdot \lambda\langle 3,2
angle = \lambda^2\left(3^2+2^2
ight) = \lambda^213 = 1.$$

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

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You have used 1 of 15 attempts

**1** Answers are displayed within the problem

### Perpendicular vectors practice 2

3.0/3 points (graded)

 $oldsymbol{L}$  is the line  $oldsymbol{2x-y=1}$ .

• Find a nonzero vector perpendicular to  $m{L}$ .

(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  $oldsymbol{L}$ .

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

[1,2]

**✓ Answer:** [1,2]

ullet Find a unit vector perpendicular to  $oldsymbol{L}$ .



(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  $\langle 2,-1 
  angle$  (or any nonzero multiple of it) is normal to the line 2x-y=1.
- To find a vector normal to (2, -1), we create a vector by switching the components, and taking the negative of one component. This gives us the vector (1, 2). 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 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  $\hat{v}=\frac{\vec{v}}{|\vec{v}|}$ . The magnitude of our perpendicular vector is

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

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

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You have used 1 of 15 attempts

**1** Answers are displayed within the problem

#### 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]?

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