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First name _____

LARSON—MATH 310—CLASSROOM WORKSHEET 02
Dot Products

Review

- What is \mathbb{R} , \mathbb{R}^2 ?
- What is a *vector* in \mathbb{R}^2 ?
- How do you add two vectors in \mathbb{R}^2 ?
- What is a scalar multiple of a vector \vec{v} in \mathbb{R}^2 ?
- How does the collection of scalar multiples $c\vec{v}$ correspond to a line in \mathbb{R}^2 ?
- If you have two vectors \vec{v} , \vec{w} in \mathbb{R}^2 with different slopes, why is it that *any* vector \vec{u} can be written as $a\vec{v} + b\vec{w}$ for some scalars a , b ?

Let $\vec{v} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ and $\vec{w} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$.

1. Find $\vec{v} \cdot \vec{w}$.

2. Find $\vec{v} \cdot \vec{v}$.

3. Find $\vec{w} \cdot \vec{w}$.

4. Find $\|\vec{v}\|$.

5. Find $\|\vec{w}\|$.

Let $\vec{v} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ and $\vec{w} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$.

6. Find a unit vector in the direction of \vec{v} .

7. Find a unit vector in the direction of \vec{w} .

8. Let θ be the angle between \vec{v} and \vec{w} . Find θ .

9. Check that if \vec{u} is a unit vector then $\vec{u} \cdot \vec{u} = 1$.

10. Check that if \vec{v} and \vec{w} are vectors that point in the same direction then $\vec{v} \cdot \vec{w} = \|\vec{v}\| \cdot \|\vec{w}\|$.

11. Check that if \vec{v} and \vec{w} are perpendicular then $\vec{v} \cdot \vec{w} = 0$.

12. Check that if the angle between \vec{v} and \vec{w} is θ then $\cos \theta = \frac{\vec{v} \cdot \vec{w}}{\|\vec{v}\| \cdot \|\vec{w}\|}$.