Linear Algebra Unit 1 quiz 1: Adding and scaling vectors in n dimensions, Dot product, length and orthogonality in n dimensions, Linear combination

Name _____ Date _____ Period _____

8 questions, 21 points

1. Let $\mathbf{u} = (2, -3, 6, 1, 1)$ and $\mathbf{v} = (2, -3, -1, -3, 4)$ in $\mathbb{R}^5$. Find $5\mathbf{u} - 2\mathbf{v}$. (2 points)

2. Let $\mathbf{u} = (-2, -3, 1, -3, 4)$ and $\mathbf{v} = (4, 4, 3, -1, -3)$. Find the exact value of $\cos\theta$, where θ is the angle between $\mathbf{u}$ and $\mathbf{v}$, and say whether θ is acute, right or obtuse. (2 points)

3. Decide whether $\mathbf{b} = (16, -7, -2, 16)$ is a linear combination of $\mathbf{v}_1 = (2, -2, 2, 3)$ and $\mathbf{v}_2 = (-4, 1, 2, -4)$ in $\mathbb{R}^4$. If it is, find the weights; if it is not, explain why not. (2 points)

4. (3 points)

(a) Find the scalar k and the number h with $k(2, -1, h, 3) + (1, 4, 5, -2) = (-5, 7, -1, -11)$.

(b) Find the number h for which some scalar k satisfies $k(4, -2, 6, 2) = (h, 3, -9, h + 3)$, and find that k.

5. Solve $2(\mathbf{x} - \mathbf{u}) = \mathbf{v} - \mathbf{x}$ for $\mathbf{x}$ in $\mathbb{R}^4$, naming the property behind each step, where $\mathbf{u} = (5, -2, 7, 1)$ and $\mathbf{v} = (-19, 16, -20, 10)$. (3 points)

Free sample from math.wiki for classroom use. Do not post. math.wiki

6. Points $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$ of $\mathbb{R}^4$ have $\text{dist}(\mathbf{p}, \mathbf{q}) = 7$ and $\text{dist}(\mathbf{q}, \mathbf{r}) = 2$. (3 points)

(a) Use the triangle inequality to find the largest and the smallest value that $\text{dist}(\mathbf{p}, \mathbf{r})$ can have.

(b) Give points $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$ in $\mathbb{R}^4$ with these two distances for which $\text{dist}(\mathbf{p}, \mathbf{r})$ is the smallest value.

7. Find every unit vector in $\mathbb{R}^4$ that is orthogonal to all three of $\mathbf{a} = (2, -1, 0, 0)$, $\mathbf{b} = (0, 1, 1, 0)$ and $\mathbf{c} = (0, 0, 2, 1)$. (3 points)

8. Find the weights that write $\mathbf{b} = (6, 1, 9)$ as a linear combination of $\mathbf{v}_1 = (1, -2, 2)$, $\mathbf{v}_2 = (3, 3, 3)$ and $\mathbf{v}_3 = (-3, -1, -3)$. (3 points)

Free sample from math.wiki for classroom use. Do not post. math.wiki