

Math 170 - Worksheet 2

1. Find the lengths of the following vectors:

a) $\langle 1, 2 \rangle$. b) $\langle 1, -3, 7 \rangle$. c) $\langle 1, 2, 5 \rangle$.

2. Compute the dot product of the following pairs of vectors:

a) $\langle 2, -1 \rangle, \langle 5, 1 \rangle$. b) $\langle 0, 4 \rangle, \langle -8, -1 \rangle$. c) $\langle -1, 4, 2 \rangle, \langle 4, 6, 1 \rangle$.

3. Find the length of the component of \vec{u} parallel to \vec{v} (i.e. $\text{comp}_{\vec{v}} \vec{u}$). Does it point in the same direction as \vec{v} or opposite?

a) $\vec{u} = \langle 2, 1 \rangle, \vec{v} = \langle 1, 0 \rangle$.

b) $\vec{u} = \langle -2, 3 \rangle, \vec{v} = \langle 1, 1 \rangle$.

c) $\vec{u} = \langle 2, 1, -4 \rangle, \vec{v} = \langle 1, 0, \sqrt{3} \rangle$.

d) $\vec{u} = \langle -5, 0, 6 \rangle, \vec{v} = \langle 12, 1, 10 \rangle$.

4. Write the inequality or inequalities describing the

a) region in \mathbb{R}^2 that lies below the line $x - y - 2 = 0$,

b) interior of the sphere with center $(2, 0, 1)$ and radius 3,

c) the region bounded by the curves $x = y^2$ and $y = x^2$.

5. Find the value or values of a that make the given vectors orthogonal:

a) $\vec{u} = \langle a, 1 \rangle, \vec{v} = \langle 2, -3 \rangle$ b) $\vec{u} = \langle a, 2a, 4 \rangle, \vec{v} = \langle -1, 4, 2 \rangle$ c) $\vec{u} = \langle 3a, 0, 4 \rangle, \vec{v} = \langle a, 0, a \rangle$.

6. Find the cosine of the angle between:

a) $\vec{u} = \langle 2, -1, 5 \rangle, \vec{v} = \langle 1, 1, 0 \rangle$ b) $\langle 3, -2 \rangle$ and the x -axis c) $\langle 9, 0, 2 \rangle$ and the y -axis.

7. Compute $\vec{u} \times \vec{v}$:

a) $\vec{u} = \langle 0, 2, 1 \rangle, \vec{v} = \langle 1, 3, 4 \rangle$. b) $\vec{u} = \langle -1, -1, 3 \rangle, \vec{v} = \langle 0, 2, -3 \rangle$. c) $\vec{u} = \langle 1, 0, -3 \rangle, \vec{v} = \langle 3, 0, -9 \rangle$.

Answers:

1. a) $\sqrt{5}$ b) $\sqrt{59}$ c) $\sqrt{30}$ 2. a) 9 b) -4 c) 22 3. a) 2, same b) $1/\sqrt{2}$, same c) $2\sqrt{3} - 1$, opposite d) 0.

4. a) $x - y - 2 > 0$ b) $x^2 - 4x + y^2 + z^2 - 2z - 4 < 0$, that is, $(x - 2)^2 + y^2 + (z - 1)^2 < 9$ (c) There are several ways of writing this. One way is: $x^2 \leq y \leq \sqrt{x}$, $0 \leq x \leq 1$. 5. a) $3/2$ b) $-8/7$ c) 0, $-4/3$

6. a) $1/2\sqrt{15}$ b) $3/\sqrt{13}$ c) 0 7. a) $\langle 5, 1, -2 \rangle$ b) $\langle -4, -3, -2 \rangle$ c) $\langle 0, 0, 0 \rangle$.