

Quiz 1

Name: _____

Thurs. 1/22/04

1. Find the unit vector u which has the same direction as the vector $a = \langle 1, -2, 3 \rangle$.

$$|a| = \sqrt{1 + 4 + 9} = \sqrt{14}. \text{ Hence } u = \frac{1}{\sqrt{14}} \langle 1, -2, 3 \rangle.$$

2. Let $a = -3i + 2j + k$ and $b = i + 2j + 2k$ be vectors in space. Find:

a. $a - 2b$

$$a - 2b = \langle -3 - 2, 2 - 4, 1 - 4 \rangle = \langle -5, -2, -3 \rangle.$$

b. $a \cdot b$

$$a \cdot b = -3 + 4 + 2 = 3.$$

c. $a \times b$

$$a \times b = \langle 4 - 2, 1 + 6, -6 - 2 \rangle = \langle 2, 7, -8 \rangle.$$

d. The projection of a onto b .

$$\text{proj}_b a = \left(\frac{a \cdot b}{|b|^2} \right) b = \frac{3}{9} \langle 1, 2, 2 \rangle.$$

e. Are a and b perpendicular? If not, find the angle between them.

a and b are not perpendicular because $a \cdot b \neq 0$. The angle between them is $\theta = \cos^{-1}\left(\frac{3}{3\sqrt{14}}\right) = \cos^{-1}\left(\frac{1}{\sqrt{14}}\right)$.