

Calc 3 - Assignment #2

Note Title

9/8/2011

① Find $\vec{a} + \vec{b}$, $2\vec{a} + 3\vec{b}$, $\|\vec{a}\|$, and $\|\vec{a} - \vec{b}\|$ for

a) $\vec{a} = 4\vec{i} + \vec{j}$, $\vec{b} = \vec{i} - 2\vec{j}$

Review

b) $\vec{a} = \vec{i} + 2\vec{j} - 3\vec{k}$, $\vec{b} = -2\vec{i} - \vec{j} + 5\vec{k}$

c) $\vec{a} = 2\vec{i} - 4\vec{j}$, $\vec{b} = 2\vec{j} - \vec{k}$

② Find a unit vector that has the same direction as:

Review

a) $-3\vec{i} + 7\vec{j}$

b) $8\vec{i} - \vec{j} + 4\vec{k}$

③* If \vec{v} lies in the 1st quadrant of \mathbb{R}^2 and

makes an angle of $\pi/4$ with the x-axis

and $\|\vec{v}\| = 4$, find \vec{v} in component form, i.e.

$\vec{v} = \langle a, b \rangle$, where a, b are the components to find.

④ Find the unit vectors parallel to the

tangent line to the parabola $y = x^2$ at

the point $(2, 4)$.

⑤ If A, B, C are the vertices of a triangle,

find $\vec{AB} + \vec{BC} + \vec{CA}$

⑥ If $\vec{r} = \langle x, y, z \rangle$ and $\vec{r}_0 = \langle x_0, y_0, z_0 \rangle$, describe the set of all points (x, y, z) such that

$$\|\vec{r} - \vec{r}_0\| = 1$$

⑦ Which expression makes sense, where \cdot is dot-product

a) $(\vec{a} \cdot \vec{b}) \vec{c}$ b) $\|\vec{a}\| (\vec{b} \cdot \vec{c})$ c) $\vec{a} \cdot (\vec{b} + \vec{c})$

d) $\vec{a} \cdot \vec{b} + \vec{c}$ e) $\|\vec{a}\| \cdot (\vec{b} + \vec{c})$

⑧ Find dot product of two vectors if their lengths are 6 and $\frac{1}{3}$ and the angle between them is $\frac{\pi}{4}$.

⑨ Find $\vec{a} \cdot \vec{b}$ for

a) $\vec{a} = \langle -2, \frac{1}{j} \rangle$, $\vec{b} = \langle -5, \pi \rangle$

b) $\vec{a} = \langle 4, 1, \frac{1}{4} \rangle$, $\vec{b} = \langle 6, -3, -8 \rangle$

⑩ Find angle between \vec{a} and \vec{b} for:

a) $\vec{a} = \langle \sqrt{3}, 1 \rangle$, $\vec{b} = \langle 0, 5 \rangle$

b) $\vec{a} = \langle 4, 0, 2 \rangle$, $\vec{b} = \langle 2, -1, 0 \rangle$

c) $\vec{a} = i + 2j - 2k$, $\vec{b} = 4i - 3k$

⑪ Are the vectors orthogonal, parallel, or neither?

a) $\vec{a} = \langle -5, 3, 7 \rangle$, $\vec{b} = \langle 6, -8, 2 \rangle$

b) $\vec{a} = \langle -3, 9, 6 \rangle$, $\vec{b} = \langle 4, -12, -8 \rangle$

c) $\vec{a} = \langle 7, 0, -2 \rangle$, $\vec{b} = \langle 2, 5, 7 \rangle$

(12) For what values of b are the vectors $\langle -6, b, 2 \rangle$ and $\langle b, b^2, b \rangle$ orthogonal?

(13) Find the directional angles (cosines) of $\langle 3, 4, 5 \rangle$

(14)* If $\vec{r} = \langle x, y, z \rangle$, $\vec{a} = \langle a_1, a_2, a_3 \rangle$ and $\vec{b} = \langle b_1, b_2, b_3 \rangle$, show that the equation

$$(\vec{r} - \vec{a}) \cdot (\vec{r} - \vec{b}) = 0$$

is a sphere. Find its center and radius.

(15)* Show that if $\vec{u} + \vec{v}$ and $\vec{u} - \vec{v}$ are orthogonal, then \vec{u} and \vec{v} must have the same length.