SI Session: January 26^{th} & 28^{th}, 2008
Mondays: 4:50 PM – 6:20 PM
Tuesdays: 1:30 PM – 3:00 PM
Wednesdays: 4:50 PM – 6:20 PM
Room 1245 SNAD

Prof. Stockton : Calculus III
Spring 2009
SI Leader : Neil Jody

[1] Find the vectors $\vec{u}$ and $\vec{v}$ whose initial and terminal points are given. Show that are

$\vec{u}$ and $\vec{v}$ equivalent.

(a) $\vec{u}:(-4,0),(1,8)$
$\vec{v}:(2,-1),(7,7)$

(b) $\vec{u}:(-4,-1),(11,-4)$
$\vec{v}:(10,13),(25,10)$

[2] Find the vector $\vec{v}$ where $\vec{u}=\langle 2,-1\rangle$ and $\vec{w}=\langle 1,2\rangle$. Illustrate the vector operations geometrically.

(a) $\vec{v}=\vec{u}+\vec{w}$

(b) $\vec{v}=5\vec{u}-3\vec{w}$

[3] Find the following: $\|\vec{u}\|$, $\|\vec{v}\|$, $\|\vec{u}+\vec{v}\|$, $\left\|\frac{\vec{u}}{\|\vec{u}\|}\right\|$, $\left\|\frac{\vec{v}}{\|\vec{v}\|}\right\|$, and $\left\|\frac{\vec{u}+\vec{v}}{\|\vec{u}+\vec{v}\|}\right\|$.

(a) $\vec{u} = \langle 0,1 \rangle$
$\vec{v} = \langle 3,-3 \rangle$

[4] Find a unit vector (1) parallel to and (2) normal to the graph of $f(x)$ at the given point.

(a) $f(x) = \sqrt{25 - x^2}$, $(3,4)$

(b) $f(x) = \tan x$, $\left(\dfrac{\pi}{4}, 1\right)$

[5] Let $\vec{u}_0 = \langle x_0, y_0 \rangle, \vec{u} = \langle x, y \rangle$, and $c > 0$. Describe the set of all points $P(x, y)$ such that $\|\vec{u} - \vec{u}_0\| = c$.

[6] Find the coordinates of the point.

(a) The point is located seven units in front of the *yz*-plane, two units to the left of the *xz*-plane, and one unit below the *xy*-plane.

(b) The point is located in the *yz*-plane, three units to the right of the *xz*-plane, and and two units above the *xy*-plane.

[7] What is the *x*-coordinate of any point in the *yz*-plane.

[8] Find the distance between the given points.

(a) $(-2,3,2),\ (2,-5,-2)$

(b) $(2,2,3),\ (4,-5,6)$

[9] Write the equation of the sphere in standard form. State the center and the radius.

(a) $x^2 + y^2 + z^2 + 9x - 2y + 10z + 19 = 0$

[10] Find the vector $\vec{v}$ with magnitude $\sqrt{5}$ and direction of $\vec{u} = \langle -4, 6, 2 \rangle$.

[11] Find the angle θ between the vectors.

(a) $\vec{u} = 3\hat{i} + 2\hat{j} + \hat{k}$
$\vec{v} = 2\hat{i} - 3\hat{j}$

(b) $\vec{u} = 2\hat{i} - 3\hat{j} + \hat{k}$
$\vec{v} = \hat{i} - 2\hat{j} + \hat{k}$

[12] Determine whether $\vec{u}$ and $\vec{v}$ are orthogonal, parallel, or neither.

(a) $\vec{u} = -2\hat{i} + 3\hat{j} - \hat{k}$
$\vec{v} = 2\hat{i} + \hat{j} - \hat{k}$

(b) $\vec{u} = \langle \cos\theta, \sin\theta, -1 \rangle$
$\vec{v} = \langle \sin\theta, -\cos\theta, 0 \rangle$

[13] Find the projection of $\vec{u}$ onto $\vec{v}$ and the vector component of $\vec{u}$ orthogonal to $\vec{v}$
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(a) $\vec{u} = \langle 2, -3 \rangle$, $\vec{v} = \langle 3, 2 \rangle$

(b) $\vec{u} = \langle 1, 0, 4 \rangle$, $\vec{v} = \langle 3, 0, 2 \rangle$

[14] Find $\vec{u} \times \vec{v}$ and show that it is orthogonal to both $\vec{u}$ and $\vec{v}$.

(a) $\vec{u} = \langle -10, 0, 6 \rangle$, $\vec{v} = \langle 7, 0, 0 \rangle$

(b) $\vec{u} = \hat{i} + 6\hat{j}$, $\vec{v} = -2\hat{i} + \hat{j} + \hat{k}$

[15] Verify that the points are the vertices of a parallelogram, and find its area.
$(2,-3,1),(6,5,-1),(3,-6,4),(7,2,2)$

[16] Find the area of the triangle with the given vertices: $(1,2,0),(-2,1,0),(0,0,0)$