SI Session: February 2^{nd} & 4^{th}, 2009
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] Let $\vec{u} = 2\hat{i} + 5\hat{j} + \vec{k}$ and $\vec{v} = 3\hat{i} - \hat{j} + 7\hat{k}$.

(a) Find the vector which has the same length as $\vec{u}$ and the opposite direction as $\vec{v}$.

(b) Determine if the vector $\vec{w} = \hat{i} + 2\hat{k}$ lies in the plane of $\vec{u}$ and $\vec{v}$.

(c) Find all unit vectors which are orthogonal to both $\vec{u}$ and $\vec{v}$.

(d) Find the angle between $\vec{u}$ and $\vec{v}$.

[2] Find the vector that has length 3 and has the opposite direction as $\langle -1,2,4 \rangle$.

[3] Let $\vec{u} = \langle -1,4,-2 \rangle$. Find a vector $\vec{v}$ such that the area of the parallelogram spanned by $\vec{u}$ and $\vec{v}$ is 10.

[4] Find a set of parametric equations of the described line.

(a) The line that passes through the point $(-4,5,2)$ and is parallel to the *xy*-plane and the *yz*-plane.

(b) The line that passes through the point $(-4,5,2)$ and is perpendicular to the plane given by $-x+2y+z=5$.

(c) The line that passes through the point $(-1,4,-3)$ and is parallel to $\vec{v}=5\hat{i}-\hat{j}$.

(d) The line that passes through the point $(-6,0,8)$ and is parallel to the line $x=5-2t$, $y=2t-4$, $z=0$.

[5] Find an equation of the described plane.

(a) The plane that passes through $(2,3,-2),(3,4,2)$, and $(1,-1,0)$.

(b) The plane that passes through the point $(1,2,3)$ and parallel to the *yz*-plane.

(c) The plane that passes through the points $(3,2,1)$ and $(3,1,-5)$ and is perpendicular to the plane $6x+7y+2z=10$.

(d) The plane that passes through the points $(4,2,1)$ and $(-3,5,7)$ and is parallel to the *z*-axis.

[6] Determine all values of c such that the angle between the vectors $\vec{u} = \langle -1,0,1 \rangle$ and $\vec{v} = \langle c,3,1 \rangle$ is 45°.

[7] Find parametric equations for the line through $(3,1,-2)$ that intersects and is perpendicular to the line given by: $x = -1+t, y = -2+t, z = -1+t$.

[8] Find an equation of the plane that contains the following lines:

$l_1 : x = t, y = 2 - t, z = 2 + 3t$ and $l_2 : x = 1 + 4t, y = 1, z = 5 + 2t$

[9] Find the distance from the point (1,2,3) to the plane $x + y - 2z = 1$.

[10] (a) If two nonzero vectors are parallel, what can be said about the angle between them?

(b) Suppose that $\vec{u}$ and $\vec{v}$ are nonzero vectors in space satisfying $\|\vec{u} \times \vec{v}\| = 0$. Show that $\vec{u}$ and $\vec{v}$ must be parallel.

[11] Determine if the vectors $\langle -1,1,2\rangle, \langle 2,1,-1\rangle$ and $\langle 4,-1,-5\rangle$ lie in a common plane.

[12] Determine a and b so that the points $(1,-1,1), (2,-5,-1)$ and $(-1,a,b)$ lie on the same line.

[13] Simplify:

(a) $$\frac{6y\left(4x^2+5y^2\right)^{1/2}-24x^2y\left(4x^2+5y^2\right)^{-1/2}}{4x^2+5y^2}$$

(b) $$\frac{\left(3x+2\right)^{\frac{1}{2}}\left(\frac{1}{3}\right)\left(2x+3\right)^{-\frac{2}{3}}\left(2\right)-\left(2x+3\right)^{\frac{1}{3}}\left(\frac{1}{2}\right)\left(3x+2\right)^{-\frac{1}{2}}\left(3\right)}{3x+2}$$

(c) $$\frac{1}{2}\left[w^3\left(9w+1\right)^5\right]^{-\frac{1}{2}}\left[w^3\left(5\right)\left(9w+1\right)^4\left(9\right)+\left(9w+1\right)^5\left(3w^2\right)\right]$$