

# MATH 153 Summer 2005 Calculus

Lecturer: Oguz KURT  
Quiz 6

Name: \_\_\_\_\_

1. (7 points) Find the distance from  $(1, -1, 2)$  to the plane  $x + 3y + z = 7$

$(7, 0, 0)$  is a point on the plane  $\Rightarrow u = \langle 7 - 1, 0 - (-1), 0 - 2 \rangle = \langle 6, 1, -2 \rangle$   
 $\vec{n} = \langle 1, 3, 1 \rangle$  is the normal vector of plane

$$\text{Then distance} = \left| \frac{\vec{n} \cdot u}{|\vec{n}|} \right| = \left| \frac{6 + 3 - 2}{\sqrt{1+9+1}} \right| = \frac{7}{\sqrt{11}}$$

2. (7 points) Find the volume of the parallelepiped determined by  $\mathbf{u} = 3\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ ,  $\mathbf{v} = \mathbf{i} + \mathbf{j} + 2\mathbf{k}$ ,  $\mathbf{w} = \mathbf{i} + 3\mathbf{j} + 3\mathbf{k}$ .

$$\text{Volume} = \left| \begin{vmatrix} 3 & 2 & 1 \\ 1 & 1 & 2 \\ 1 & 3 & 3 \end{vmatrix} \right| = \left| 3 \begin{vmatrix} 1 & 2 \\ 3 & 3 \end{vmatrix} - 2 \begin{vmatrix} 1 & 2 \\ 1 & 3 \end{vmatrix} + 1 \begin{vmatrix} 1 & 1 \\ 1 & 3 \end{vmatrix} \right|$$

$$= \left| 3(-3) - 2(1) + 1(2) \right| = \left| -9 - 2 + 2 \right| = 9$$

3. (7 points) Find the equation of the line tangent to the curve  $\mathbf{r}(t) = \sin t \mathbf{i} + t\mathbf{j} + \cos t \mathbf{k}$  at the point  $P(0, 0, 1)$ .  $\mathbf{r}(0) = (0, 0, 1)$  is at  $t = 0$

$$\mathbf{r}'(t) = \cos t \mathbf{i} + \mathbf{j} + (-\sin t) \mathbf{k} \quad \mathbf{r}'(0) = \mathbf{i} + \mathbf{j}$$

$$\begin{aligned} \mathbf{l}(t) &= \mathbf{r}(0) + \mathbf{r}'(0)t = \langle 0, 0, 1 \rangle + \langle 1, 1, 0 \rangle t \\ &= \langle t, t, 1 \rangle \end{aligned}$$