

ASSIGNMENT 7

19-March-2007

1. Find a parametric equation of the line that contains the points $(3, 2, 0)$ and $(0, -1, -1)$.
2. Find the distance and relative position of two cars approaching the same intersection A if their displacement vectors from A are $\mathbf{i} + 3\mathbf{j} - \mathbf{k}$ and $\mathbf{j} + 2\mathbf{k}$.
3. Find the angles in the triangle with vertices $(0, 3, 4)$, $(0, 3, 0)$, and $(12, 0, 5)$.
4. Let \mathbf{v} and \mathbf{w} be nonzero vectors so that $\|\mathbf{v}\| = \|\mathbf{w}\|$ and let $\mathbf{a} = \|\mathbf{v}\|\mathbf{w} + \|\mathbf{w}\|\mathbf{v}$. Show that the angles between \mathbf{v} and \mathbf{a} and \mathbf{w} and \mathbf{a} are the same.
5. Find an equation of the plane that contains the point $(0, -2, 2)$ and is orthogonal to the vector $\langle 3, 0, -1 \rangle$.
6. Prove that $\mathbf{a} \times (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \cdot \mathbf{c})\mathbf{b} - (\mathbf{a} \cdot \mathbf{b})\mathbf{c}$, for $\mathbf{a}, \mathbf{b}, \mathbf{c} \in \mathbb{R}^3$.
7. Now prove that $\mathbf{a} \times (\mathbf{b} \times \mathbf{c}) + \mathbf{b} \times (\mathbf{c} \times \mathbf{a}) + \mathbf{c} \times (\mathbf{a} \times \mathbf{b}) = \mathbf{0}$, for $\mathbf{a}, \mathbf{b}, \mathbf{c} \in \mathbb{R}^3$.

8. Show that

$$\lim_{(x,y) \rightarrow (-1,2)} \frac{y-2}{x+1}$$

does not exist.

9. Find the limit

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y}{x^4 + y^2}$$

if it exists.

10. Define a vector valued function $\mathbf{F}: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ by $\mathbf{F}(\mathbf{x}) = \mathbf{x} \times \mathbf{a}$, where \mathbf{a} is a fixed vector in \mathbb{R}^3 . Find all points where \mathbf{F} is continuous. Find all points where $\mathbf{G}(\mathbf{x}) = \mathbf{x} \times \mathbf{a} / \|\mathbf{x} \times \mathbf{a}\|$ is continuous.