MATH 271 – Homework #1

due 29 January 2009

All calculations must be done in Maple!

1) Let the following vectors be defined:

\[ \mathbf{a} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \]
\[ \mathbf{b} = \begin{bmatrix} 3 \\ -2 \\ -1 \end{bmatrix} \]

a) Find the area of the parallelogram with adjacent sides given by \( \mathbf{a} \) and \( \mathbf{b} \).

b) Find the angle between these two vectors.

c) In this angle acute or obtuse? Explain.

2) Suppose a particle travels according to the position vector

\[ \mathbf{r} = \begin{bmatrix} \sin 2t \\ 2t \\ \cos 2t \end{bmatrix} \]

Plot the path of this particle from \( t = 0 \) to \( t = 10 \). What is the name of this curve?

3) Let a velocity vector be given by

\[ \mathbf{v} = \begin{bmatrix} t^2 \\ e^{-3t} \\ \sin 5t \end{bmatrix} \]

Suppose we know that the position vector when \( t = 0 \) is given by

\[ \mathbf{r}_0 = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix} \]

Determine the acceleration and position vectors for all \( t \).