Question 3 is a bonus.

DEPARTMENT OF MATHEMATICS & STATISTICS
MATH 1503

Paper Assignment 2

Instructions: Complete each of the following tasks.

Homework problems to be handed in can be found in part **C** below.

A. Read the text, sections 1.1 and 1.2. And look at the first part of *Things I Must Remember* on page 615. It will also be helpful to read chapter 12 in the Stewart calculus text. (Copies are on reserve in the libraries.)

B. Try some of the following problems from the text for practice (not to be handed in). It will be a few days or more before we cover all these topics.

Page 19 – 2a, 3, 8c, 9a, 12b, 13a, 15, 18a, 20a, 26a, 27, 32, 41, 48a

Page 37 – True/False questions

Page 38 – 1, 3, 5, 7(a,b), 8, 11(a), 13(a), 15, 24, 25

Page 59 – True/False questions

Page 60 – 2, 3, 4(a), 6, 13(a), 14(a), 18(a), 19, 21, 22, 23(a),24, 25(a), 28(a)

C. Hand in the following problems, as instructed in class. **Points**

1. In this question, let $\mathbf{u} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$. (5)

   (a) Draw $\mathbf{u}$ and $\mathbf{v}$ in standard position, that is, as arrows starting from the origin.

   (b) In the same picture, draw $\mathbf{u}+\mathbf{v}$ by shifting the tail of $\mathbf{v}$ to the head of $\mathbf{u}$, and so forth. Clearly indicate your arrow for $\mathbf{u}+\mathbf{v}$.

   (c) In the same picture still, draw $\frac{-1}{2}\,\mathbf{u}$ in standard position.

– this question continues on reverse side –

– same $\mathbf{u}, \mathbf{v}$ as before –

(d) Find scalars a, b such that

$$\begin{bmatrix} 2 \\ 1 \end{bmatrix} = a\mathbf{u} + b\mathbf{v}.$$

(e) What simple geometrical property of $\mathbf{u}$ and $\mathbf{v}$ guarantees here that <u>any</u> vector can somehow be written as a linear combination of them? This means that what you did for $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ in the previous part can actually be done for any vector $\begin{bmatrix} x \\ y \end{bmatrix}$.

2. Find scalars a, b, neither of them 0, and a scalar c, such that (2)

$$a \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} + b \begin{bmatrix} 2 \\ -4 \\ c \end{bmatrix} = \mathbf{o}.$$

Note that $\mathbf{o}$ is the zero vector in $\mathbb{R}^3$.

Bonus 3. Determine the exact angle in degrees between these vectors in $\mathbb{R}^4$: (2)

$$\mathbf{p} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} \text{ and } \mathbf{q} = \begin{bmatrix} 1 \\ -1 \\ -1 \\ -1 \end{bmatrix}$$

4. Find a unit vector in the direction of $\mathbf{w} = 2\mathbf{i} - 2\mathbf{j} + \mathbf{k}$ in $\mathbb{R}^3$. (1)