Quiz 2

Question 1.

Suppose that $\boldsymbol{s}$ is a n-vector that represents the transaction of a supermarket company, that gives the sales amount (in HKD) of n products. What is the meaning of the dot product of $\boldsymbol{s}$ and $\mathbf{1}$, where $\mathbf{1}$ is an one vector with appropriate dimension. Your answer should be in English.

(3 marks)

Question 2

Consider two documents: **A and B**

A is the text:

```
I like video. Peter likes Trump and Money. Trump likes dog. His
dog is called Happy.   Corgi is a kind of dogs. Dogs like
walking.
```

B is the text:

```
I like computer games. Peter likes Trump and Money. I like cats.
Cats eat fishes. My cat is called Spider.
```

Suppose the dictionary is {dog, cat, Trump}.

(a) Based on the dictionary, build two feature vectors $\boldsymbol{a}$ and $\boldsymbol{b}$ to represent the **A** and **B** .
(b) Discuss the ways to measure the similarity of these two documents,

Remark: The common practice: count variations of a word as the same word; for example, `rain', `rains', `raining' and 'rained' are counted as `rain'.

(10 marks)

Question 3

Let $\boldsymbol{a} = \begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}$, $\boldsymbol{b} = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$, and t_1, t_2 be any real numbers.

(a) Find all vectors $\boldsymbol{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = t_1\boldsymbol{a} + t_2\boldsymbol{b}$, **in terms of** t_1 and t_2
(b) Is the vector $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ one of the vectors your find in (a).
(c) Define a set: $\mathbb{A} = \{\boldsymbol{x} = t_1\boldsymbol{a} + t_2\boldsymbol{b}$ such that $\|\boldsymbol{x}\| = 1\}$, with vector addition and scalar multiplication. Does the set $\mathbb{A}$ forms a vectorspace? Explain.

(7 marks)