QUESTION 1. (COMPULSORY: 30 MARKS)

(a) Name any two TEX distributions used by windows users? [1 mark]

(b) What do you understand by Debugging as used in the course? [2 marks]

(c) Using diagrams show the difference in the compiling process of a latex document using bibtex and embedded styles. [4 marks]

(d) Write the control sequences that will produce the following symbols. [3 marks]

i. ^

ii. _

iii. #

(e) Define a command '\be' with two arguments such that the first argument takes a name of an environment and the second one takes the content to be enclosed by the environment. [4 marks]

(f) There are two styles commonly used in LATEX to write bibliography. Name them and giving a valid reason explain which one is more flexible. [4 marks]

(g) Write a preamble that can be used to produce the following extract. NOTE the citations are links of color green and cross-references are links of color red. [6 marks]

Manchester United Team	
Position	Player
Goalkeeper	Henderson
	De Gea
Defender	Wan-Bissaka
	Shaw
	Lindelof
	Maguire

Table 1: Manchester United Squad

2 A First figure

In this section we look at the following figure.

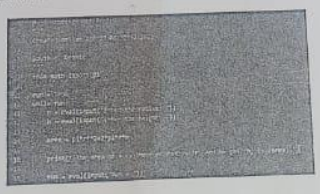

Figure 1: A python program

By Theorem 1.2 is [2, Theorem 12.3]. Also looking at Table 1 and Figure 1.
The studies in [1, 3, 2] are in the area of Mathematics.

(h) With the aid of an example differentiate between 'in-line' and 'display' math. [4 marks]

(i) Equation numbering is important for cases where some equations are referenced in the document. Name two environments and two control sequences that aid in this process. [2 marks]

QUESTION 2. (20 MARKS)

(a) You have an image that you want to use in your latex document. What's the first step you will take to include the image and give a short LaTeX code including the image ('img.png' for example). Caption: 'My first image'. What package(s) do you require? [6 marks]

(b) With the aid of examples, explain one reason for the occurrence of each of the following errors in LaTeX:

(i) Missing $ [4 marks]

(ii) Misplaced alignment tab [6 marks]

(c) i. Identify and correct the errors in the following extract.

```
\documentclass[12pt, a4paper]{article}

\begin{document}
Consider the following set:
\begin{equation}
S = \left.\left\{\frac{n+1}{n}\right|n\in \mathbb{N}\right\}
\end{equation}


\begin{align*}
\lim_{n\to\infty}\frac{n+1}{n} = 1, \Rightarrow \inf S = 1.
\end{align*}
\end{document}
```

ii. Write the output of the above after correction. [4 marks]

QUESTION 3. (20 MARKS)

(a) Write the source code that will produce the table below.

Man Utd Team	
Position	Player
Goalkeepers	Onana
	Heaton
Defenders	Wan-Bissaka
	Varane
	Martínez
	Shaw

Table 1: Manchester United Squad

[8 marks]

(b) Write a new commands with the following properties:

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Your Name

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1 Math Environments

There are two types of math environments;

1. **In-line math.** This is an example of in-line math. $x^2 + y = z$. This will appear on the same paragraph as any other text here. Even x on its own should be written in a math environment.

2. **Display math.** This is an example of display math

$$x^2 + y = z.$$

This will not appear on the same paragraph as any other text here. Even x on it's own should be written in a math environment.

2 Equations

Consider the following;

$$\frac{\partial y}{\partial x} + x^2 = 0 \tag{1}$$

3 Align and align*

Example 3.1. Consider the following:

$$\frac{\partial y}{\partial x} + \frac{\partial^2 y}{\partial x^2} + \phi = 0 \tag{2}$$

$$\dot{y} + \ddot{y} + \phi = 0 \tag{3}$$

Theorem 3.2. [1, Theorem 2.3] *Here is an example of a Theorem environment. The text is slanted.*

Question Two [20 Marks]

(a) What is a "macros" in LaTeX? Why is it neccessary to define one's own procedures in a programming language?

(b) Write the LaTeXcodes that perform the following functions;

(i) Define a command that typesets its argument as both bold and italic.

(ii) Define a command that takes two arguments; a font sizing command (e.g. small) and a line of text, and define the command so that the text in the second argument is centered and is sized according to the first argument.

Question Three [20 Marks]

Write LaTeXCode that produces the document entitled Poincaré's h-Cobordism and the price of fish, shown below;

The scientific world has been astonished by an announcement from Dr Tony Strainer, a mathematics lecturer at the University of Nuneaton, establishing a definite link between Poincaré's h-Cobordism and the price of fish. A partner in this remarkable work is Mr Bert Wilkins, fishmonger and amateur algebraic topologist. Explained Dr Strainer: "we have established a proof of Drivle's Theorem when the fish function C is finitely-undermined, via a new form of the Rincewind inequality".

Their work is due to appear in the *Proceedings of the Iceland Cod Fisheries Society of London, Series D.*

Professor Hertz of Göttingen has remarked: "this result is very ex
ing... We may now be able to show that $f(C)$ is indeed grease-proof, thus
opening the way to a mathematical systematisation of wet fish."

estion Four [20 Marks]

LaTeXCode that produces a one page document titled "Actuarial Sci-

(c) Which one of the following is the odd one out. Why? [2 marks]
A) `miktex` B) `pdftex` C) `texlive` D) `mactex`

(d) State three reasons why you-as a mathematician-would choose LaTeX to write your academic report. [6 marks]

(e) Write the output of the following lines extracted from a LaTeX editor: [4 marks]

```
This document
is in LaTeX. Consider $x+y=4$
This is the second
paragraph. Now consider $$2x+y=6$$
```

(f) Explain any two reasons why one would choose BibTeX bibliography management style in their LaTeX document. [4 marks]

(g) i. What is the first step you take to include a figure in your LaTeXdocument before writing the code to include it. [2 marks]

ii. Suppose the picture file is named `fig1.png`. Write the code to include the figure in your document. Use any caption of your choice and label the figure. [4 marks]

QUESTION 2. (20 MARKS)

(a) Name any two differences between embedded and Bibtex bibliography management style. [4 mark]

(b) Write the code to produce the following matrices. [Ignore the preamble and document environment].

i. $\begin{vmatrix} 2 & 7 \\ -4 & 8 \end{vmatrix}$ [2 marks]

ii. $\begin{bmatrix} 5 & -7 \\ 3 & -3 \end{bmatrix}$ [2 marks]

(c) Give an example (code and output) to demonstrate the difference between 'in-line' and 'display' math. [4 marks]

(d) Give any two scenarios that may lead to a `missing package` error can occur. Give an example of each. [4 marks]

(e) Write the following math in LaTeX (Ignore preamble). [4 marks]