|  |  |  |  |
| --- | --- | --- | --- |
| **MATH1111 (2015/16)** | **Analytical Methods for Computing** | **Header ID 227726** | **Contribution 50% of course** |
| **Course Leader Dr Yvonne Fryer** | **Release Date Friday 18/03/2016** |  | **Deadline Date Friday 08/04/2016** |
| **This coursework will be marked anonymously YOU MUST NOT PUT ANY INDICATION OF YOUR IDENTITY IN YOUR SUBMISSION** | | | |
| This coursework should take an average student who is up-to-date with tutorial work approximately 25 hours   Feedback and grades are normally made available within 15 working days of the coursework deadline | | | |
| **Learning Outcomes:**  A. Use functions in the context of computing.  B. Design and use simple algorithms.  C. Use vectors and matrices in a variety of applications.  D. Understand small network graphs and apply them to a variety of problems.  E. Understand some basic concepts of differential and integral calculus and apply them in the context of computing. | | | |

|  |
| --- |
| Plagiarism is presenting somebody else's work as your own. It includes: copying information directly from the Web or books without referencing the material; submitting joint coursework as an individual effort; copying another student's coursework; stealing coursework from another student and submitting it as your own work.  Suspected plagiarism will be investigated and if found to have occurred will be dealt with according to the procedures set down by the University. Please see your student handbook for further details of what is / isn't plagiarism. Details are also on the [Student Intranet](https://cms1.gre.ac.uk/student/plagiarism.asp)  **All material copied or amended from any source (e.g. internet, books) must be referenced correctly according to the reference style you are using.**  **Your work will be submitted for plagiarism checking.  Any attempt to bypass our plagiarism detection systems will be treated as a severe Assessment Offence.**  By handing in your coursework to the Faculty Reception Desk you are confirming that it has not, in whole or part, been presented elsewhere for assessment.  In addition, you are confirming that   * All material which has been copied has been clearly identified, for example, by being placed inside quotation marks and a full reference to the source has been provided * Any material which has been referred to or adapted has been clearly identified and a full reference to the source has been provided * Any work not in quotation marks is in your own words * You have not shared your work with any other student, unless this was a group assignment in which case it has only been shared with members of the group when necessary * You have not taken work from any other student * You have not paid anyone to do your work or employed the services of an essay or code writing agency |

#### Coursework Submission Requirements

#### A paper copy of your work for this coursework must be submitted to the Faculty Reception Desk before the office closes on the Deadline Date of Friday 08/04/2016.

#### Email your file for question 6 to [y.d.fryer@gre.ac.uk](mailto:y.d.fryer@gre.ac.uk) with the subject:

#### *MATH1111 Q6 student\_id ie MATH1111 Q6 000123456*

#### You must submit your coursework with a bar-coded coursework header that YOU MUST PRINT YOURSELF. These can be found on [BannerWeb](https://cms1.gre.ac.uk/student/bannerweb.asp). Just follow the instructions and print your header sheet for this assessment item and submit it with your coursework.

#### Hand your work with the Header Sheet to the Faculty Reception Desk.

#### There is no facility to upload an electronic copy of your work for this coursework.

#### Remember to keep your coursework receipt.

#### All courseworks must be submitted as above. Under no circumstances can they be accepted by academic staff

The University website has details of the current Coursework Regulations, including details of penalties for late submission, procedures for Extenuating Circumstances, and penalties for Assessment Offences.  See <http://www2.gre.ac.uk/current-students/regs>

**Detailed Specification**

The coursework is to be completed individually

**Deliverables**

Students need to produce a piece of written work that includes all the working out and answers for the following questions.

The submission for question 6 should be emailed as directed above.

**Grading Criteria**

Grades can be easily worked out by looking at the marks allocated for each part of the coursework. An excellent coursework is one that is complete, has few errors and includes working and therefore will receive a mark in excess of 70%. A coursework that is just a pass at 40% will have multiple errors, working missing and possibly even questions missing. To be certain of getting the best mark include all working and attempt all questions.

**Assessment Criteria**

The marks allocated per section of the coursework are identified in brackets by the side of a question.

**Answer all questions, working needs to be shown to get full marks.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| * At the top of your page write down your banner student id., starting with three zeros. i.e., |  |  |  |  |  |  |  |  |  |  |
| 0 | 0 | 0 | 9 | 0 | 2 | 4 | 8 | 2 |  |
|  |  |  |  |  |  |  |  |  |  |
| * Ignore the first three zeros, *replace any remaining 0’s by 1’s.* i.e., |  |  |  |  |  |  |  |  |  |  |
|  |  |  | **9** | **1** | **2** | **4** | **8** | **2** |  |
|  |  |  |  |  |  |  |  |  |  |
| * Order your id. from smallest to largest. i.e., |  |  |  |  |  |  |  |  |  |  |
|  |  |  | **2** | **4** | **7** | **7** | **8** | **8** |  |
|  |  |  |  |  |  |  |  |  |  |
| * Label the values **A**-**F** as shown |  |  |  |  |  |  |  |  |  |  |
|  |  |  | **A** | **B** | **C** | **D** | **E** | **F** |  |
|  |  |  |  |  |  |  |  |  |  |
| * Write down the values of **A** to **F**, for your student id. on your coursework submission. | | | | | | | | | |  |
| * Use the values for **A** to **F** in the following questions where applicable as constants. | | | | | | | | | |  |

**1: Functions**

a) Sketch the graph of the following function and detail the amplitude, period and frequency of the function.

[6 marks]

b) The following functions are defined for all real numbers. Sketch the graphs and find the range of each function.

i. ii.

[6 marks]

c) Find the inverse of the function below and plot both on a graph.

Describe what the function would look like and include on your graph, carefully labelling all three functions.

[6 marks]

**2: Matrices**

a) Write down the quadrilateral Q

Draw its position on a graph.

Write down a matrix R that will produce a reflection along the line .

Use the transformation on Q and draw the transformed quadrilateral on the graph. Make sure to clearly label both quadrilaterals

[6 marks]

b) Write down matrices L, M and N such that,

L=M = and N =

Find:

* 1. LM
  2. ML
  3. LN
  4. N2

[8 marks]

**3: Graph theory**

a) Five towns Apple Cross, Beehive Farm, Cricketheath, Dentwich, East Green and Fare Way are connected by roads with the lengths (Km) as in the table below

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Distance (Km) | Apple Cross | Beehive Farm | Cricketheath | Dentwich | East Green | Fare Way |
| Apple Cross | - | 7 | 20 |  | 10 |  |
| Beehive Farm |  | - | 15 | 10 | 15 |  |
| Cricketheath |  |  | - | 10 |  |  |
| Dentwich |  |  |  | - | 18 | 15 |
| East Green |  |  |  |  | - | 12 |
| Fare Way |  |  |  |  |  | - |

1. Draw this as a graph.
2. Write down the adjacency matrix for the town distance information.
3. Determine a matrix that contains information on walks of length 2 for the towns.
4. How many walks of length 2 are there from Apple Cross to Dentwich? Determine the shortest route from Apple Cross to Dentwich travelling via one other town.

[14 marks]

**4: Algorithms**

Investigate the following algorithm.

**function** unknown(n : integer)

**if** n ≤ 1

**return** false

**else if** n ≤ 3

**return** true

**else if** n mod 2 = 0 **or** n mod 3 = 0

**return** false

**let** i ← 5

**while** i×i ≤ n

**if** n mod i = 0 **or** n mod (i + 2) = 0

**return** false

i ← i + 6

**return** true

* The algorithm reads in *an integer n*.
* What is the output?
* Try various integer values in the algorithm to help you decide, such as 7, 18 …

|  |  |
| --- | --- |
| **Input** | **Output** |
| **N** | **false/true** |
| 7 | ? |
| 18 | ? |
| ... | ... |
|  |  |
|  |  |

* Include your working with your answer as justification for your decision about the algorithm

[16 marks]

**5: Differentiation/Integration/Calculus q**

a) Differentiate the following functions

i.  ii.

b) Given plot the function over the interval [**0**, **7**] and find the value of the following definite integral and show what this means on the graph of the function.

[18 marks]

**6: General**

For one of the MATH1111 course topics listed below, create an electronic poster, presentation or video/animation as detailed below.

Course topic choices:

Functions,

Matrices,

Graph Theory,

Algorithms,

Calculus (Differentiation, Integration)

Electronic Poster

Your poster should summarise the key aspects of the topic that we have covered and provide one application example. (The poster can be 1 PowerPoint slide that contains all the required information.)

You will need to email your poster to me on the day the assignment is due (8th April 2016) [y.d.fryer@gre.ac.uk](mailto:y.d.fryer@gre.ac.uk) and then present your poster to your MATH1111 tutorial group the following tutorial (15th April 2016).

Or,

Presentation

Your presentation should summarise the key aspects of the topic that we have covered and provide one application example. You can use PowerPoint, Prezi or a similar presentation tool. (The presentation can be 3 PowerPoint slides or equivalent maximum.)

You will need to email your presentation to me on the day the assignment is due (8th April 2016) [y.d.fryer@gre.ac.uk](mailto:y.d.fryer@gre.ac.uk) and then talk through your presentation to the rest your MATH1111 tutorial group the following tutorial (15th April 2016).

Or,

Video

Your video/animation should summarise the key aspects of the topic that we have covered and provide one application example. You can use PowToon (the free version at [www.powtoon.com](http://www.powtoon.com) or a similar tool. (The video can be 2 minutes maximum.)

You will need to email your video to me on the day the assignment is due (8th April 2016) [y.d.fryer@gre.ac.uk](mailto:y.d.fryer@gre.ac.uk) and then show the video to the rest your MATH1111 tutorial group the following tutorial (15th April 2016).

There are 10 marks available for the poster/presentation/video. (Two marks each for - Informative, Correct, Interesting, Relevant, Creative). 10 marks are available at the tutorial (five for delivery and five for understanding).

[20 marks]