8.6 ADDENDUM

SEMESTER 1

ASSIGNMENT 01

Multiple Choice Assignment

Fixed closing date: 17 February 2021

Unique Assignment Number: 843981

- This multiple-choice assignment will be marked by computer. The closing date is fixed and no extension of time can be granted.
- Your answers must be entered on an optical mark reading sheet. Before you attempt that, please study in detail the relevant chapter of *Unisa: Services and Procedures*.
- Please make sure that you know how to handle the optical mark reading sheets, since sheets that are marked incorrectly will be rejected by the computer, and students will not receive any marks.
- The unique assignment number appearing above links your assignment to the corresponding set of answers in the computer. It must be filled in correctly in the optical mark reading sheet.
- Your assignment will not be returned to you. Please keep a record of your answers so that you can compare them with the solutions that we will send out.
- In each of the following 10 questions four possible answers are given. In each case, mark the number of the answer that you think is correct.
- For each correct answer you obtain 10 marks, and for each incorrect one you lose 2 marks. The maximum you can score is 100 marks which is 100%.

QUESTION 1

Normally Octave outputs numbers with 5 significant figures. Use the help facility with the keyword format to find how to get output with 15 significant figures. Then evaluate $\sqrt{2}$ to 15 significant figures.

1. 1.41421356237310
2. 1.4142
3. 1.41421789429067
4. 2.0

QUESTION 2

Solve the simultaneous equations

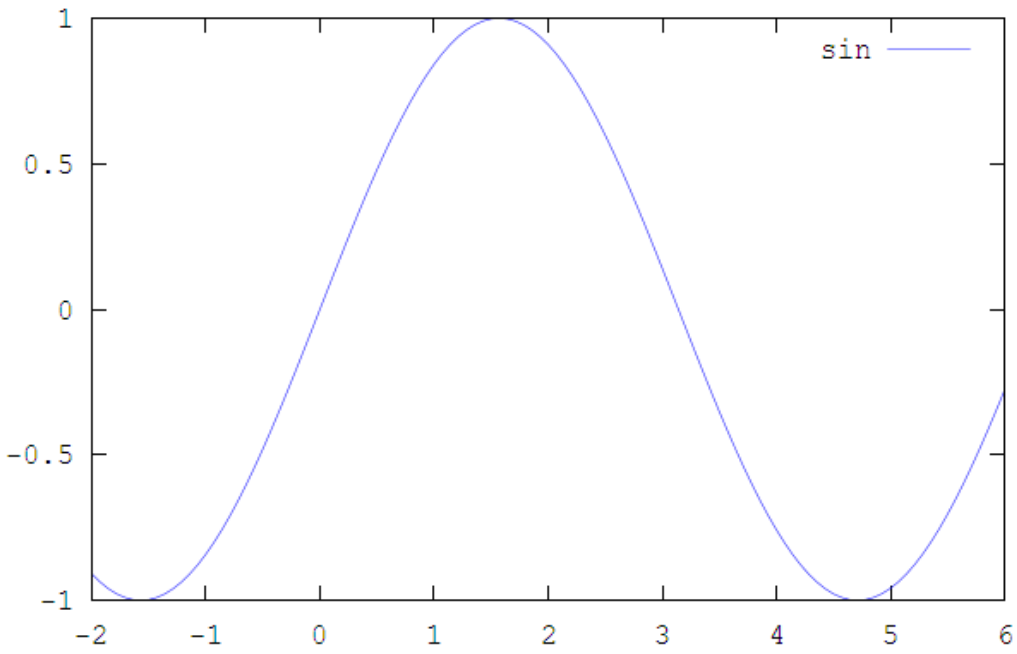
$$2\,x_1 + 5\,x_2 = 6$$

$$4\,x_1 + 3\,x_2 = 2$$

1. $x_1 = 0.5,\ x_2 = 0.66667$
2. $x_1 = -0.98768,\ x_2 = 1.41421$
3. $x_1 = -0.57143,\ x_2 = 1.42857$
4. $x_1 = 3,\ x_2 = 2$

QUESTION 3

Which command generated the following graph?



1. `fplot(@sin,[-2,6])`
2. `fplot(@sin2,6])`
3. `plot(sin,[-2,6])`
4. `fplot(@sin,[-1,1])`

QUESTION 4

Evaluate the series

$1^2 + 2^2 + 3^2 + ... + 100^2$

1. 338350
2. 10000
3. 278950
4. 33348

QUESTION 5

Evaluate the series $\sum_{n=1}^{\infty} u_n$ in which u_n is not known explicitly but is given in terms of a recurrence relation. You should stop the summation when $|u_n| < 10^{-8}$

$u_{n+1} = (u_n)^2$ with $u_1 = 0.5$

1. 0.81642
2. 1.25578
3. 0.00001
4. 134560

QUESTION 6

A formula to find a numerical approximation to the second derivative of a function $f(x)$ is

$$f''(x) = \frac{d^2 f}{dx^2} = \frac{f(x+h) - 2f(x) + f(x-h)}{h^2}$$

with the approximation being better and better as $h \to 0$. Write a function file deriv2.m that implements the formula. The inputs should be the function to be differentiated (remember the function handle construct @), the value of x, and the value of h. Use your code to estimate the second derivative of $\sin(x)$ at $x = \pi/4$ with $h = 10^{-1}$.

1. -0.78540
2. -0.70711
3. -0.70652
4. 0.70711

QUESTION 7

A rather beautiful fractal picture can be obtained by plotting the points (x_i, y_i) generated by the following difference equations

$$x_{i+1} = y_i\,(1 + \sin(0.7\,x_i)) - 1.2\,\sqrt{|x_i|}$$

$$y_{i+1} = 0.21 - x_i$$

starting with $(x_1, y_1) = (0, 0)$. Write a program to work out the first 10 000 points and draw the picture (plot individual points and do not join them). Look at the graph and estimate the coordinates of the point with the largest value of x.

1. $(x, y) = (0.5, -0.2)$
2. $(x, y) = (0, 0)$
3. $(x, y) = (0.35, 0.2)$
4. $(x, y) = (0.1, 1.1)$

QUESTION 8

Which one of the given Octave statements correctly represents the following mathematical formula?

$$S = \frac{13}{19}\left(\sum_{k=1}^{n} a_k \sqrt{b_k}\right)^3$$

You may assume that n-dimensional row vectors `a` and `b` have been defined

1. `S=(13/19)*sum(a.*sqrt.(b))^3`
2. `S=(13/19)*sum(a*sqrt(b))^3`
3. `S=(13/19)*(a.*sqrt(b)).^3`
4. `S=(13/19)*sum(a.*sqrt(b))^3`

QUESTION 9

In the following formula, *R* can take any value between 5 and 6. Work out the value of *I* for *R* = 5.00, 5.01, 5.02, ... , 5.99, and 6. Then find the average value of *I*.

$$I = \frac{25}{\sqrt{R^2 + 20\pi^2}}$$

1. 1.6733
2. 1.6568
3. 1.6368
4. 1.6574

QUESTION 10

A is a 50 × 50 matrix that has 1 in every entry except on the main diagonal where each entry is -0.5

$$A = \begin{pmatrix} -0.5 & 1 & 1 & \cdots & 1 \\ 1 & -0.5 & 1 & \cdots & 1 \\ 1 & 1 & \ddots & 1 & \vdots \\ \vdots & \cdots & 1 & -0.5 & 1 \\ 1 & \cdots & 1 & 1 & -0.5 \end{pmatrix}.$$

Let $B = A^{-1}$, then find B_{12}.

1. 0.013746
2. 0.5
3. 1
4. -0.65292