UNIVERSITY OF SOUTHAMPTON, ELECTRONICS AND COMPUTER SCIENCE

COMP2208
Math problem sheet 1

1 OVERVIEW

The key points of this problem-sheet are:

- This problem-sheet counts for 5% of this module.
- The questions in this problem-sheet are in multiple-choice format. For each question, select the solution from the choices given.
- You will have one week to complete the problem-sheet.
- The deadline[1] for submission of your solutions: **23rd Oct. 2020 by 4pm.**
- Summative feedback will be given within 2 weeks after the deadline.
- Learning Outcome: Test your knowledge on limits and derivatives.

For submission instructions, please see Section 3 at the end of this document.

2 PROBLEMS

QUESTION 1 (1 point). Consider a balanced search tree of infinite size with branching number $\kappa = 2$, see figure 1. In a breadth-first search on this tree a solution was found after checking $N = 4726$ nodes. What level has been reached?

[1] Solutions submitted after the deadline will not be accepted.

a 10

b 13

c 11

d 12

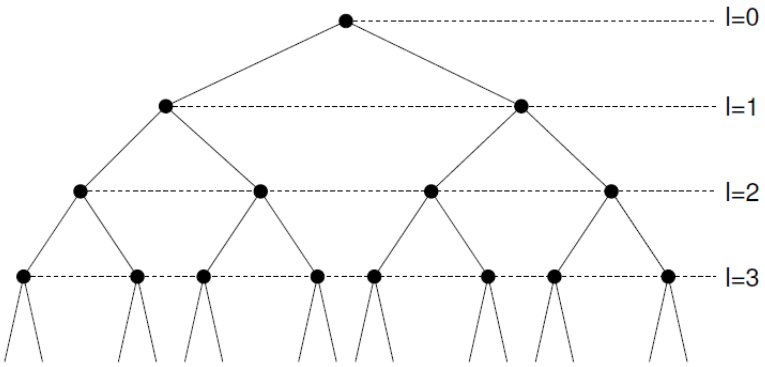

Figure 1: The first four levels of a balanced search tree with branching number $\kappa = 2$.

QUESTION 2 (1 point). Calculate the solution to the limit,

$$\lim_{n\to\infty}(1-\frac{1}{n})^{-3n}$$

Solutions are rounded to four decimal places.

a 20.0855

b 20.2856

c 20.3879

d 20.3123

QUESTION 3 (1 point). Calculate the solution to the limit,

$$\lim_{n\to\infty}\left(\frac{\sqrt{n^{16}-2n^{15}}-n^8}{10n^7+7}\right)^3$$

a -0.005

b -0.0001

c -0.001

d -0.1

QUESTION 4 (1 point). Find the solution of

$$\frac{d}{dx}\arccos x$$

a $2/(3+x^2)$

b $-1/\sqrt{1-x^2}$

c $-1/(1+x^2)$

d $-1/(2+x^2)$

QUESTION 5 (1 point). Find the solution of

$$\frac{d}{dx}\cos^2(e^{2x})$$

a $-e^{2x}\sin(e^{2x})\cos(e^{2x})$

b $-e^{4x}\sin(e^{4x})\cos(e^{4x})$

c $4e^{2x}\sin(e^{2x})\cos(e^{2x})$

d $-4e^{2x}\sin(e^{2x})\cos(e^{2x})$

3 SUBMISSION INSTRUCTIONS

Submit your work using the ECS electronic hand-in system. The submission is to be made by **4pm** on the due date listed above. Please submit a single file to the ECS electronic hand-in system as detailed below:

- Your submission file must be named as **comp2208-ps1.txt**.
- Your submitted file must be in a **plain ASCII text file format**.
- You can use Notepad (Windows operating system users) or vim, emacs etc. (Linux users) to create the file.

- Each line of the submitted text file should only contain the question number, followed by a single space, and the selected solution for that question.
- Example, if a, b, c, d and a are the solutions you have selected for Questions 1, 2, 3, 4 and 5, respectively, your submitted file should have the following:

```
1 a
2 b
3 c
4 d
5 a
```

- So, a problem sheet with five questions will have five lines of text.
- Make sure the questions are answered in ascending order in your text file.
- Failure to follow these instructions will incur a penalty.