

THE UNIVERSITY OF BRITISH COLUMBIA
CPSC 320 2016WT2: WEEKLY QUIZZES

Full Name: _____

Exam ID: _____

Signature: _____

UBC Student #: _____

Important notes about this examination

1. You have 25 minutes to complete this quiz.
2. **Answer all questions in PEN and write CLEARLY and LEGIBLY.**
3. You are allowed to bring up to (the equivalent of) a 3-inch 3-ring binder of notes and 3 textbooks, and nothing else. Justify all you answers.
4. Use the back of the pages for your notes, or if you need extra space for the answer to any question.
5. Good luck!

Student Conduct during Examinations

1. Each examination candidate must be prepared to produce, upon the request of the invigilator or examiner, his or her UBCcard for identification.
2. Examination candidates are not permitted to ask questions of the examiners or invigilators, except in cases of supposed errors or ambiguities in examination questions, illegible or missing material, or the like.
3. No examination candidate shall be permitted to enter the examination room after the expiration of one-half hour from the scheduled starting time, or to leave during the first half hour of the examination. Should the examination run forty-five (45) minutes or less, no examination candidate shall be permitted to enter the examination room once the examination has begun.
4. Examination candidates must conduct themselves honestly and in accordance with established rules for a given examination, which will be articulated by the examiner or invigilator prior to the examination commencing. Should dishonest behaviour be observed by the examiner(s) or invigilator(s), pleas of accident or forgetfulness shall not be received.
5. Examination candidates suspected of any of the following, or any other similar practices, may be immediately dismissed from the examination by the examiner/invigilator, and may be subject to disciplinary action:
 - i. speaking or communicating with other examination candidates, unless otherwise authorized;
 - ii. purposely exposing written papers to the view of other examination candidates or imaging devices;
 - iii. purposely viewing the written papers of other examination candidates;
 - iv. using or having visible at the place of writing any books, papers or other memory aid devices other than those authorized by the examiner(s); and,
 - v. using or operating electronic devices including but not limited to telephones, calculators, computers, or similar devices other than those authorized by the examiner(s)—(electronic devices other than those authorized by the examiner(s) must be completely powered down if present at the place of writing).
6. Examination candidates must not destroy or damage any examination material, must hand in all examination papers, and must not take any examination material from the examination room without permission of the examiner or invigilator.
7. Notwithstanding the above, for any mode of examination that does not fall into the traditional, paper-based method, examination candidates shall adhere to any special rules for conduct as established and articulated by the examiner.
8. Examination candidates must follow any additional examination rules or directions communicated by the examiner(s) or invigilator(s).

Please do not write in this space:

Quiz Number: _____

Tutorial Section: _____



Compare running times of the algorithms on graphs

February 7, 2017

Consider the following pairs of functions representing runtimes of algorithms that take a graph with n vertices and m edges as the input (simple graph though, no self-loops, no directed edges, no multiple edges between the same pair of vertices). For each pair, write between them the best choice of:

- **LEFT** to indicate that the left one is big- O of the right one, i.e., $\text{left} \in O(\text{right})$
- **RIGHT** to indicate that the right one is big- O of the left one, i.e., $\text{right} \in O(\text{left})$
- **SAME** to indicate that two are Θ of each other, i.e., $\text{left} \in \Theta(\text{right})$
- **INCOMPARABLE** to indicate that none of the previous relationships holds for all possible values of n and m .

Do not write **LEFT** or **RIGHT** if **SAME** is true.

Examples:

For **any** graph we have:

Left function	LEFT/RIGHT/SAME/INCOMPARABLE	Right function
$n + m$	RIGHT	m

For a graph that is **a tree** we have:

Left function	LEFT/RIGHT/SAME/INCOMPARABLE	Right function
$n + m$	SAME	m

1 Any graph

Left function	LEFT/RIGHT/SAME/INCOMPARABLE	Right function
n		m
n^2		m
n^2		$m \log n$
$n \log m^2$		$n \log n$

2 A connected graph

Now, solve the same problem if we assume that the graph is **connected**.

Left function	LEFT/RIGHT/SAME/INCOMPARABLE	Right function
n		m
n^2		m
n^2		$m \log n$
$n \log m^2$		$n \log n$

3 A tree

Now, solve the same problem if we assume that the graph is a **tree**.

Left function	LEFT/RIGHT/SAME/INCOMPARABLE	Right function
n		m
n^2		m
n^2		$m \log n$
$n \log m^2$		$n \log n$

4 A complete graph

Finally, solve the same problem if we assume that graph is **complete** (there is an edge between each pair of distinct vertices).

Left function	LEFT/RIGHT/SAME/INCOMPARABLE	Right function
n		m
n^2		m
n^2		$m \log n$
$n \log m^2$		$n \log n$