COMP 550
Algorithms and Analysis
Spring 2020
Pop Quiz 4

Don't forget to write your name on the quiz sheet. This quiz continues on the back.

1. What is the height of a heap of size n, as a function of n? Choose the best answer.
   a) $\Theta(2^n)$
   b) $\Theta(n^2)$
   c) $\Theta(n)$
   d) $\Theta(\lfloor \log_2 n \rfloor)$

2. What is the worst case asymptotic time bound for quicksort? Choose the best answer.
   a) $\Theta(2^n)$
   b) $\Theta(n^2)$
   c) $\Theta(n \log_2 n)$
   d) $\Theta(n)$

3. How long does it take to build a max heap of n elements? Choose the best answer.
   a) $\Theta(2^n)$
   b) $\Theta(n^2)$
   c) $\Theta(n \log_2 n)$
   d) $\Theta(n)$

4. Give an asymptotic estimate for the sum $1 + \frac{1}{2} + \frac{1}{3} + \ldots + \frac{1}{n}$. Choose the best answer.
   a) $\Theta(n^2)$
   b) $\Theta(n \log_2 n)$
   c) $\Theta(n)$
   d) $\ln n + O(1)$

5. Solve the recurrence $T(n) = T(\sqrt{n}) + O(n)$. Choose the best answer.
   a) $T(n) = \Theta(n)$
   b) $T(n) = \Theta(n \log_2 n)$
   c) $T(n) = \Theta(n^2)$
   d) $T(n) = \Theta(2^n)$

6. What is the expected number of inversions in a random permutation of n elements? Choose the best answer.
   a) 2^n
   b) n^2
   c) $n(n-1)/2$

d) $n(n-1)/4$

7. Compute the sum of the series $2 + 2/3 + 2/9 + 2/27 + ...$ 3

8. Compute $\sum_{j=0}^{\infty} \frac{j}{2^j}$. 2

9. Solve the recurrence $T(n) = T(n-1) + \Theta(n)$. Chioose the best answer.
   a) $T(n) = \Theta(n)$
   b) $T(n) = \Theta(n \log_2 n)$
   c) $T(n) = \Theta(n^2)$
   d) $T(n) = \Theta(2^n)$