CSC6013 - Worksheet for Week 5

Back Substitution

Compute the complexity of the recursive algorithms based on the recursive equation and stop condition. Show your work, not just your final answer.

1. $T(n) = 2T(n-1) + 1$ and $T(0) = 1$

    a. You can compute this complexity as a tight upper bound.

2. $T(n) = T(n-2) + n^2$ and $T(0) = 1$

    a. Hint: Assume n is even; that is, n = 2k for some integer k.

3. $T(n) = T(n-1) + 1/n$ and $T(1) = 1$

    a. Hint: Go online and find a formula for the sum of the first n terms of the "harmonic series".

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Master Method

Compute the complexity of the recursive algorithms based on the recursive equation and stop condition. Show your work, not just your final answer.

4. $T(n) = 2T(n/4) + 1$ and $T(0) = 1$

    a. Be sure to rewrite 1 as n^0.

5. $T(n) = 2T(n/4) + n^{1/2}$ and $T(0) = 1$

    a. Note that $n^{1/2}$ is the square root of n.

6. $T(n) = 2T(n/4) + n^2$ and $T(0) = 1$

    a. This is similar to the previous one.

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Master Method

Compute the complexity of the recursive algorithms based on the recursive equation and stop condition. Show your work, not just your final answer.

7. $T(n) = 10T(n/3) + n^2$ and $T(0) = 1$

a. In your answer, round the value of the logarithm to 2 decimal places.

b. Remember that the $\log_b(a)$ is equal to $\log_2(a) / \log_2(b)$.

8. $T(n) = 2T(2n/3) + 1$ and $T(0) = 1$

a. In your answer, round the value of the logarithm to 2 decimal places.

b. Be sure to rewrite 1 as n^0.

c. Remember that the $\log_b(a)$ is equal to $\log_2(a) / \log_2(b)$.

d. Hint: rewrite $2n / 3$ as $n / (3/2)$