Problem Set #2

Quiz, 5 questions

5/5 points (100%)

Congratulations! You passed!

Next Item

1 / 1
point

1.
This question will give you further practice with the Master Method. Suppose the running time of an algorithm is governed by the recurrence $T(n) = 7 * T(n/3) + n^2$. What's the overall asymptotic running time (i.e., the value of T(n))?

- $\theta(n^{2.81})$
- $\theta(n^2)$

Correct
a=7, b=3, d=2. Since b^d > a, this is case 2 of the Master Method.

- $\theta(n^2 \log n)$
- $\theta(n \log n)$

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1 / 1
point

2.
This question will give you further practice with the Master Method. Suppose the running time of an algorithm is governed by the recurrence $T(n) = 9 * T(n/3) + n^2$. What's the overall asymptotic running time (i.e., the value of T(n))?

- $\theta(n^{3.17})$
- $\theta(n^2)$
- $\theta(n^2 \log n)$

Correct
a = b^d = 9, so this is case 1 of the Master Method.

- $\theta(n \log n)$

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1 / 1
point

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3.

This question will give you further practice with the Master Method. Suppose the running time of an algorithm is governed by the recurrence $T(n) = 5 * T(n/3) + 4n$. What's the overall asymptotic running time (i.e., the value of T(n))?

- $\theta(n^2)$
- $\theta(n \log(n))$
- $\theta(n^{2.59})$
- $\theta(n^{\frac{\log 3}{\log 5}})$
- $\theta(n^{\log_3(5)})$

Correct

a = 5, b = 3, d = 1. Since a > b^d, this is case 3 of the Master Method.

- $\theta(n^{5/3})$

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1 / 1
point

4.

Consider the following pseudocode for calculating a^b (where a and b are positive integers)

```
FastPower(a,b) :
  if b = 1
    return a
  else
    c := a*a
    ans := FastPower(c,[b/2])
  if b is odd
    return a*ans
  else return ans
end
```

Here [x] denotes the floor function, that is, the largest integer less than or equal to x.

Now assuming that you use a calculator that supports multiplication and division (i.e., you can do multiplications and divisions in constant time), what would be the overall asymptotic running time of the above algorithm (as a function of b)?

- $\Theta(\log(b))$

Correct

Constant work per digit in the binary expansion of b.

- $\Theta(b)$

$\Theta(b \log(b))$

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$\Theta(\sqrt{b})$

5/5 points (100%)

1 / 1
point

5.
Choose the smallest correct upper bound on the solution to the following recurrence: $T(1) = 1$ and $T(n) \leq T([\sqrt{n}]) + 1$ for $n > 1$. Here [x] denotes the "floor" function, which rounds down to the nearest integer. (Note that the Master Method does not apply.)

- $O(\sqrt{n})$
- $O(\log n)$
- $O(1)$
- $O(\log \log n)$

Correct
Bingo! This answer may be easiest to see by writing n as $2^{\log n}$ and then noting that every square-root operation cuts the exponent in half.