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Problem Set #2

5 questions

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))?

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

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))?

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

1 point

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))?

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

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)?

- $\Theta(b)$
- $\Theta(\sqrt{b})$
- $\Theta(\log(b))$
- $\Theta(b \log(b))$

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.)

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

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