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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))?

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

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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 $T(n) \le T([\sqrt{n}]) + 1$ for $n \gt 1$. Here [x] denotes the "floor" function, which rounds down to the nearest integer. (Note that the Master Method does not apply.)

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

5 questions unanswered

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