← Volver Problem Set #2
Cuestionario Calificado • 30 min

Vencimiento 30 de ago. 1:59 CDT

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Problem Set #2

Calificación de la entrega más reciente: 100 %

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))?

1 / 1 punto

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

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

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))?

1 / 1 punto

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

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

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))?

1 / 1 punto

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

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

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

1 / 1 punto

```
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)?

◉ $\Theta(\log(b))$

○ $\Theta(\sqrt{b})$

○ $\Theta(b\log(b))$

○ $\Theta(b)$

Correcto
Constant work per digit in the binary expansion of b.

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.)

1 / 1 punto

○ $O(\log n)$

◉ $O(\log \log n)$

○ $O(\sqrt{n})$

○ $O(1)$

Correcto
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.