

Use the Master Theorem to solve the following recursive equations by **showing each of the steps described in class**.

(a) $T(n) = 4T(n/2) + 7n^2 - 2n$

1. $f(n)$ already function

2. $a=4$ $b=2$ $f(n) = 7n^2 - 2n$

3. $n^{\log_b a} = n^{\log_2 4} = n^2$

4. Compare $f(n)$ to $n^{\log_b a}$

$7n^2 - 2n = \Theta(n^2)$ so case 2

$\Rightarrow T(n) = \Theta(n^{\log_b a} \lg n) = \underline{\underline{\Theta(n^2 \lg n)}}$

(b) $T(n) = 2T(n/3) + \Theta(n^2)$

1. Convert $f(n)$ to function $\Rightarrow f(n) = kn^2$

2. $a=2$ $b=3$ $f(n) = kn^2$

3. Compute $n^{\log_b a} = n^{\log_3 2} = n^{0.63}$

4. Compare $f(n)$ to $n^{\log_b a}$

$kn^{2.4} > n^{0.63}$ try case 3

Since $kn^2 = \Omega(n^{0.63+\epsilon})$ for $\epsilon = .1$ $kn^2 = \Omega(n^{0.73})$

regularity $2k(\frac{n}{3})^2 \leq ckn^2 \Rightarrow \frac{2}{9} \leq c < 1$ let $c = \frac{1}{2}$

$\Rightarrow T(n) = \Theta(f(n)) = \underline{\underline{\Theta(n^2)}}$