*OK Not OK*

$f_i \in O(f_j) \iff i \le j$

$f_1(n) = 3^n$

$f_2(n) = n^{\frac{1}{3}}$

$f_3(n) = 12$

$f_4(n) = 2^{\log_2 n}$

$f_5(n) = \sqrt{n}$

$f_6(n) = 2^n$

$f_7(n) = \log_2 n$

$f_8(n) = 2^{\sqrt{n}}$

$f_9(n) = n^3$

$f = O(g) f = \Omega(g) f = \Theta(g)$ ***Briefly***

$rll f(n) g(n)$

$(i) \log_3 n \log_4 n$

$(ii) n \log(n^4) n^2 \log(n^3)$

$(iii) \sqrt{n} (\log n)^3$

$(iv) 2^n 2^{n+1}$

$(v) n (\log n)^{\log \log n}$

$(vi) n + \log n n + (\log n)^2$

$(vii) \log n! n \log n$

$f(\cdot)$

$f_1 f_2$

$f : \to c > 0 f(n) \in O(n^c) \alpha > 1 f(n) \in \Omega(\alpha^n)$

*tight* $T(n)$

$T(n) = 2 \cdot T(\frac{n}{2}) + \sqrt{n} T(n) = T(n-1) + c^n c > 0 T(n) = 2T(\sqrt{n}) + 3 T(2) = 3$

$\Theta$

$T(n) = 3T(n/4) + 4n^2$

$T(n) = 45T(n/3) + .1n^3$

$T(n) = 2T(\sqrt{n}) + 5 T(2) = 52$

$T(n) = 2T(n/2) + n \log n$

*Hint: split up the* $\log(n/(2^i))$ *terms into* $\log n - \log(2^i)$*, and use the formula for arithmetic series.*

$_t heorem Wikipedia, incorporates this result. The case of the master theorem which applies to this problem is:$

*If* $T(n) = aT(n/b) + f(n)$ *where* $a \ge 1,\ b > 1,$ *and* $f(n) = \Theta(n^c \log^k n)$ *where* $c = \log_b a$*, then* $T(n) = \Theta(n^c \log^{k+1} n)$*.*

$T(n) = 9T(n/3) + n^2 \log^3 n$

$nkkn$ *(You need to give a four-part solution for this problem.)*

$kln = kl O(n)$

*(You need to give a four-part solution for this problem.)*