CMPE_CMSE371 Analysis of Algorithms
Problem Set 2

Q1. Show That:

$n^2 + n = O(n^3)$

$n^3 + 4n^2 = \Omega(n^2)$

$n^2 + 5n + 7 = \Theta(n^2)$

$5n^2 + 3n + 20 = O(n^2)$

$\frac{1}{2}n^2 + 3n = \Theta(n^2)$

$(n \log n - 2\,n + 13) = \Omega(n \log n)$

$\frac{1}{2}n^2 - 3n = \Theta(n^2)$

$5n + 20 = o(n^2)$

$10n^2 + 25n + 7 = o(n^3)$

$5n^3 + 20n^2 + n + 10 = \omega(n^2)$

$10n^2 + 25n + 7 = \omega(n)$

Q2. In the following recurrences, give the asymptotic upper and lower bounds of T(n). Assume that T(n) is constant for $n \leq 10$. Keep your limits as tight as possible and justify your answers. You can try different solution methods for each option.

(a) $T(n) = 2T(n/3) + n \lg n$

(b) $T(n) = 3T(n/5) + \lg^2 n$

(c) $T(n) = T(n/2) + 2^n$

(d) $T(n) = T(\sqrt{n}) + \Theta(\lg \lg n)$

(e) $T(n) = 10T(n/3) + 17n^{1.2}$

(f) $T(n) = 7T(n/2) + n^3$

(g) $T(n) = T(n/2 + \sqrt{n}) + \sqrt{6046}$

(h) $T(n) = T(n-2) + \lg n$

(i) $T(n) = T(n/5) + T(4n/5) + \Theta(n)$

(j) $T(n) = \sqrt{n}\, T(\sqrt{n}) + 100n$