Q1

a. $5n^3 + 2n^2 + 3n < 10n^3$ for $n > 1$, $5n^3 + 2n^2 + 3n = O(n^3)$

b. $2n < \sqrt{7n^2 + 2n - 8} < 3n$ for $n > 2$, $\sqrt{7n^2 + 2n - 8} = \Theta(n)$

c. $c_1 f(n) \geq d(n)$ for $n > n_0$, $c_2 \cdot g(n) \geq e(n)$ for $n > n_1$

for $n > n_1 \wedge n > n_2$, $d(n) \cdot e(n) < c_1 \cdot c_2 \cdot f(n) \cdot g(n)$

~~open~~ bigger than the larger of the two, denoted as n_b.

$c_3 = c_1 \cdot c_2$

$d(n) \cdot e(n) \leq c_3 f(n) \cdot g(n)$ for $n > n_b$.

$d(n) \cdot e(n) = O(f(n) \cdot g(n))$.

Q2.

1) $\Theta(n^2)$
2) $\Theta(n)$
3) ~~$\Theta(n^2)$~~ $\Theta(\log(n))$
4) ~~$\Theta(n \log(n))$~~ $\Theta(n)$