Question 1

a. $5n^3+2n^2+3n=O(n^3)$

According to the definition of O ( ), f(n) $\leq$ C* O(g(n)) for all $n \geq n_0$

By setting $n_0=3$ & c greater than or equal to 6 works.

Doing the subtraction: $6n^3 - (5n^3+2n^2+3n) \geq 0$ for $n \geq 3$

So, $5n^3+2n^2+3n=O(n^3)$

b. $\sqrt{7n^2+2n-8} = \theta(n)$

According to the definition of $\theta(n)$, f(n) $\leq C_1 * \theta(n)$ and f(n) $\geq C_2 * \theta(n)$ $n \geq n_0$

By setting $n_0=1$ and $C_1=1$, f(n) $\leq C_1 * \theta(n)$.

$\sqrt{7n^2+2n-8} - n \geq 0$ when $n \geq 1$.

By setting $n_0=1$ and $C_1=4$, f(n) $\geq C_1 * \theta(n)$

$4n - \sqrt{7n^2+2n-8} \geq 0$ when $n \geq 1$

So, $\sqrt{7n^2+2n-8} = \theta(n)$

c. Show that if *d(n)=O(f(n))* and *e(n)=O(g(n))*, then the product *d(n)e(n)* is O(*f(n)g(n))*

If d(n) = *O(f(n)), then, for* C_1*(Let's say* $C_1>1$*),* $d(n) \leq C_1 * f(n)$*. The same, for* C_2*(Let's say* $C_2>1$*),* $e(n) \leq C_2 * g(n)$*.*

Therefore, $C_1*C_2*f(n)*g(n) \geq d(n)e(n)$*, for that* $C_1*C_2>1$*,(and only if the constants C is less than a certain threshold number, the equation may not hold true).*

Question 2

Def 1 = $\theta(n^2)$

Def 2 = $\theta(n)$

Def 3 = $\theta(\log(n))$

Def 4 = $\theta(n)$