Question 5:
Use the definition of Θ in order to show the following:
a. $5n^3 + 2n^2 + 3n = \Theta(n^3)$

$5n^3 + 2n^2 + 3n \leq 5n^3 + 2n^3 + 3n^3$
$5n^3 + 2n^2 + 3n \leq 10n^3$

$0 \leq 2n^2 + 3n \quad \Rightarrow \quad 3n \leq 2n^2 \quad \Rightarrow \quad 3n \leq 2n^2$ when $n \leq 1.5$. Round to 2.

$5n^3 \leq 5n^3 + 2n^2 + 3n \leq 10n^3$

$c_1 = 10$
$c_2 = 5$
$n_0 = 2$

$\Omega(n^3) = O(n^3)$

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

$\sqrt{7n^2 + 2n - 8} \leq \sqrt{7n^2 + 2n^2}$
$\sqrt{7n^2 + 2n - 8} \leq \sqrt{9n^2}$
$\sqrt{7n^2 + 2n - 8} \leq 3n$

$0 \leq \sqrt{2n - 8}$ is only a real result when $n \geq 4$.

$\sqrt{7n^2} \leq \sqrt{7n^2 + 2n - 8} \leq 3n$
$\sqrt{7}n \leq \sqrt{7n^2 + 2n - 8} \leq 3n$

$c_1 = 3$
$c_2 = \sqrt{7}$
$n_0 = 4$

$\Omega(n) = O(n)$