

Q1

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

upper bound

$$C: 10, n: 1$$

$$5n^3 + 2n^2 + 3n \leq C(n^3)$$

$$5n^3 \leq 10(n^3)$$

$$b) \sqrt{7n^3 + 2n - 8} = \Theta(n)$$

$$\sqrt{7n^3 + 2n - 8} \leq C_1(n)$$

$$\sqrt{7n^3 + 2n - 8} \geq C_2(n)$$

$$C_1 = 17, n = 1$$

$$C_2 = 1, n = 1$$

$$\sqrt{7+2-8} \leq 17$$

$$\sqrt{7+2-8} \geq 1$$

$$\sqrt{1} \leq 17$$

$$\sqrt{1} \geq 1$$

True

True

$$c) d(n) = O(f(n)), e(n) = O(g(n))$$

$$d(n) \leq C(f(n)) \text{ and } e(n) \leq C(g(n))$$

$$\therefore d(n) e(n) \leq C(f(n)g(n)) \text{ as functions is pos}$$

$$n^2 \leq C(n^2) \quad C=2, n=1$$

$$1 \leq 2 \cdot 1 \text{ True}, \therefore d(n)e(n) = O(f(n)g(n))$$

Q2

$$a) \Theta(n^2)$$

$$b) \Theta(n)$$

$$c) \Theta(\log n)$$

$$d) \Theta(n)$$