$$\text{show } T(n) = 4n^2 + 2n + 1 \in O(n^2)$$

$$4n^2 + 2n + 1 \leq cn^2$$
$$4 + \frac{2}{n} + \frac{1}{n^2} \leq c$$
$$n_0 = 1$$
$$5 \leq c$$
$$c = 7$$
$$\therefore 4n^2 + 2n + 1 \leq 7n^2$$
$$\forall n \geq 1$$

$$\text{show } T(n) = 4n^2 + 2n + 1 \in \Omega(n^2)$$
$$4n^2 + 2n + 1 \geq cn^2$$
$$4 + \frac{2}{n} + \frac{1}{n^2} \geq c$$
$$n_0 = 1$$
$$5 \geq c$$
$$c = 4$$
$$\therefore 4n^2 + 2n + 1 \geq 4n^2$$
$$\forall n \geq 1$$

$$\Theta(n^2) = \Omega(n^2) \cap (n^2)$$
$$\therefore T(n) \in \Theta(n^2)$$

(b) O(n^2)