$f(n) \leq c\, g(n)$, $\exists\, c_1 \& n_0$

$\underbrace{2n^2}_{f} \leq c \cdot \underbrace{n^3}_{g}$

$2n^2 \leq cn^3 \Rightarrow 2 \leq cn$

$c = 2$
$n_0 = 1$

$n^2 = O(n^2)$

$n^2 \leq c \cdot n^2 \Rightarrow 1 \leq c$

$c = 1$
$n_0 = 1$

$$\underbrace{1000n^2 + 1000n}_{f} = O(n^2)$$

$$f \leq c \cdot n^2$$

$$f \quad \boxed{1000n^2 + \underbrace{1000n}_{?} \leq 1000n^2 + 1000n^2}$$

$$= \underbrace{2000}_{c}\underbrace{n^2}_{g}$$

$c = 2000$

$n_0 = 1$

$$c \cdot g(n) \leq f(n)$$

$$\underbrace{5n^2}_{f} = \Omega(\underbrace{n}_{g})$$

$$c \cdot n \leq 5n^2 \Rightarrow \quad c \leq 5n$$

$$\boxed{\begin{array}{l} c = 1 \\ n_0 = 1 \end{array}}$$

$$100n + 5 \neq \Omega(n^2)$$

$\exists\ c, n_0 \quad 0 \leq \boxed{cn^2 \leq 100n + \underbrace{5}_{5n}}$

$$100n + 5 \leq 100n + 5n = \boxed{105n}$$

$$cn^2 \leq 105n$$

$$cn^2 - 105n \leq 0$$

$$n(cn - 105) \leq 0 \Rightarrow cn - 105 \leq 0$$

$$\Rightarrow n \leq \frac{105}{c}$$

$$\frac{n^2}{2} - \frac{n}{2} = \Theta(n^2)$$

$$\frac{n^2}{2} - \frac{n}{2} \leq \frac{n^2}{2}$$

$c_1 = 1/2$
$n_0 = 1$

$$\frac{n^2}{2} - \frac{n}{2} \geq \frac{n^2}{2} - \frac{n}{2} \cdot \frac{n}{2} = \frac{n^2}{4}$$

$n \geq 2$

$c_2 = \frac{1}{4}$
$n_0 = 2$

$c_1 = 1/2$
$c_2 = 1/4$
$n_0 = 2$