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

$\underbrace{2n^2}_{f} = O(\underset{=}{n^3})$ g

$2\cancel{n^2} \leq c\, n^{\cancel{3}} \Rightarrow 2 \leq c \cdot \underset{=}{n}$

$\boxed{\begin{array}{l} c = 2 \\ n_0 = 1 \end{array}}$

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

$\cancel{n^2} \leq c\,\cancel{n^2} \Rightarrow \boxed{1 \leq c}$

$n_0 = 1$

$c = 5$

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

$$f \; \boxed{1000n^2 + 1000n} \le 1000n^2 + 1000n^2 =$$

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

$$\boxed{\begin{array}{l} C = 2000 \\ n_0 = 1 \end{array}}$$

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

$$n \le c \cdot n^2$$

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

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

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

$$c \cdot \cancel{n} \leq 5n^{\cancel{2}} \Rightarrow c \leq 5n$$

$c = 1$

$n_0 = 1$

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

$$\exists\, c, n_0 \quad 0 \leq cn^2 \leq \underbrace{100n + 5} \leq 105n$$

$$100n + 5 \leq 100n + 5n = 105n$$

$$\forall n \geq 1$$

$$cn^2 \leq 105n$$

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

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

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

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

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

$$\boxed{\begin{array}{l} c_1 = \frac{1}{2} \\ \cancel{n_0 = 1} \end{array}}$$

$$\frac{n^2}{2} - \frac{n}{2} \geq \frac{n^2}{2} - \frac{n}{2} \cdot \frac{n}{2} = \frac{n^2}{4} \Rightarrow \boxed{\begin{array}{l} c_2 = \frac{1}{4} \\ n_0 = 2 \end{array}}$$

$$\boxed{n \geq 2} \longleftarrow$$