

# Spring 2022 Lecture 1

$$f(n) = \theta(g(n)) \Leftrightarrow$$

$$f(n) = O(g(n))$$

$$f(n) = \Omega(g(n))$$

$\Rightarrow$

$$c_1 g(n) \leq f(n) \leq c_2 g(n) \quad \forall n \geq n_0$$

$$f(n) = \Omega(g(n))$$

$$f(n) = O(g(n))$$

$$f(n) = O(g(n))$$

$$\Rightarrow \exists n_0, c_2, f(n) \leq c_2 g(n) \quad \forall n \geq n_0$$

$$f(n) = \Omega(g(n))$$

$$\forall n \geq n_1$$

$$\Rightarrow \exists n_1, C_1, f(n) \geq C_1 g(n) \quad (\forall n \geq n_1)$$

$\checkmark \forall n \geq n_1$

$$n_2 = \max(\underline{n_0}, \underline{n_1})$$

$$\underline{C_1 g(n) \leq f(n) \leq C_2 g(n), \text{ if } n \geq n_2}$$

$\hookrightarrow f(n) = \theta(g(n))$