Asymptotic Notation Simplified

For two functions, f and q, ...

$$f = O(g) \iff "f \leq g"$$

..."f is 'big oh' of g" means the growth rate of f is less than or equal to the growth rate of g. Said differently, it means f is eventually always smaller than or within a constant multiple of g.

$$f = \Omega(g) \iff "f \geq g"$$

..."f is 'big omega' of g" means the growth rate of f is greater than or equal to the growth rate of g. Said differently, it means f is eventually always larger than or within a constant multiple of g.

$$f = \Theta(g) \iff "f \approx g"$$

..."f is 'big theta' of g" means f is in "big oh" *and* "big omega" of g, which means f and g have the same growth rate. Said differently, it means f is eventually always within a constant multiple of g.

$$f = o(g) \iff "f < g"$$

..."f is 'little oh' of g" means the growth rate of f is strictly less than the growth rate of g. Said differently, it means f is eventually always smaller than g, even considering constant multiples.

$$f = \omega(g) \iff "f > g"$$

..."f is 'little omega' of g" means the growth rate of f is strictly greater than the growth rate of g. Said differently, it means f is eventually always larger than g, even considering constant multiples.

There's no "little theta" notation that combines "little oh" and "little omega" because f cannot be both less than and greater than g. In other words, "little theta" of anything would be the empty set.

Don't fuss the format. All the variants below are used interchangeably for all 5 symbols:

$$f = O(g), f \in O(g), f(x) = O(g(x)), f \text{ is } O(g), f \text{ is in } O(g)$$