Asymptotic Blunders

Big Oh Mistakes

“· = O(·)” defines a relation

Don’t write $O(g) = f$.

Otherwise: $x = O(x)$, so $O(x) = x$.

But $2x = O(x)$, so $2x = O(x) = x$,

therefore $2x = x$.

Nonsense!

Big Oh Mistakes

Lower bound blunder:

“$f$ is at least $O(n^2)$” should say

$n^2 = O(f)$

False Lemma:

$\sum_{i=1}^{n} i = O(n)$

Of course really:

$\sum_{i=1}^{n} i = \Theta(n^2)$
Big Oh Mistakes

False Lemma: \( \sum_{i=1}^{n} i = O(n) \)

false proof:

\[ 0 = O(1), \ 1 = O(1), \ 2 = O(1), \ldots \]

So each \( i = O(1) \). So

\[ \sum_{i=1}^{n} i = O(1) + O(1) + \cdots + O(1) \]

\[ = n \cdot O(1) = O(n). \]