Asymptotic Notations

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Equivalent

When can I say $f(n) \in O(g(n)) \approx f$

$\in \Omega(g(n)) \approx$

$\in \Theta(g(n)) \approx$

$f(n) = O(g(n))$ if I can find constants c and

such that $f(n) \leq c\, g(n)$ for ev

In the last class we said $50 + 7n = O(n)$.

So to show it we found appropriate c and

$$50 + 7n < 50 + 50n$$ f

$$\leq 50n + 50n$$

$$= 100n$$

$50 + 7n \leq c \cdot n = 100n$; whe

We can choose $n_0 = 1$

By defn of O() notation $50 + 50n = O(n)$

Now let's see whether I can say $50 + 7n =$

Ans: Yes. I want to prove

$$50 + 7n \leq c\, n^2 \quad \text{for } \ldots$$

where

$$50 + 7n < 50 + 50n < 50n^2 + 50n^2$$

I found $c = 100$ and $n_0 = 1$.

Can we show $50 + 7n = O(\lg n)$?

Ans: I want to show we cannot.

I want to show there cannot exist any

such that $50 + 7n \leq c \cdot \lg n$.

Suppose for a contradiction that $50 + 7n \leq c$

$$\Rightarrow c \geq \frac{50 + 7n}{\lg n}$$

$$= \frac{50}{\lg n} + \ldots$$

If $n \to \infty$ then $\lim_{n \to \infty} \frac{50}{\lg n} = 0$

and $\lim_{n \to \infty} \frac{7n}{\lg n} \approx \Omega(n)$

Therefore c must be larger than a func

hence it cannot be a constant.

I want to prove $\lg n^{\lg\lg n} = O\left(\left(\frac{n}{\lg\lg n}\right.\right.$

$$\lg n^{\lg\lg n} = \lg n * \lg n * \cdots * \lg n$$

I know

I know that for any $n \geq 16$

If $n = 16$ $\frac{16}{\lg\lg 16}$

$$\frac{n}{\lg\lg n} * \frac{n}{\lg\lg n} \cdots * \frac{n}{\lg\lg n}$$

$$< \left(\frac{n}{\lg\lg n}\right)^n$$

I can choose $c = 1$ and $n_0 = 16$

$f(n) = \Omega(g(n))$ if I can find constants c

such that $f(n) \geq c\, g(n)$ for

Can I say $50 + 7n = \Omega(n)$

I can choose $c = 1$ and

so that I get $50 + 7$

$f(n) = \Theta(g(n))$ iff $f(n) = O(g(n))$

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

Since I previously proved $50 + 7n$

I can claim $50 + =$