TCSS 343 - Week 1 - Thursday

Jake McKenzie

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Asymptotics

"You're always you, and that don't change, and you're always changing, and there's nothing you can do about it."

...

Neil Gaiman

"If one proves the equality of two numbers a and b by showing first that $a \leqslant b$ and then that $b \geqslant a$, it is unfair; one should instead show that they are really equal by disclosing the inner ground for their equality".

...

Emmy Noether

"These are not my stars. Even the heavens are denied me here".

...

Alidar Jarok

0. Prove the following theorem. Use a **direct proof** to find constants that satisfy the definition of big Θ or use the **limit test**. Make sure your proof is tidy. That means it is complete, concise, clear and precise.

Theorem 0. $21n - 71 \in \Theta(n)$

1. Prove the following theorem. Use a **direct proof** to find constants that satisfy the definition of big Θ or use the **limit test**. Make sure your proof is tidy. That means it is complete, concise, clear and precise.

Theorem 1. $\log n^n + 21\sqrt{n} \in \Theta(n \log n)$

2. Prove the following theorem. Use a **direct proof** to find constants that satisfy the definition of big Θ or use the **limit test**. Make sure your proof is tidy. That means it is complete, concise, clear and precise.

Theorem 2. $\log(2^n + 2) \in \Theta(n)$

3. Use the definition of big Oh notation to **prove** or **disprove** that if $f(n) \in O(g(n))$ and $g(n) \in O(f(n))$ then $f(n) = g(n) \forall n$.

4. Using what you know prove or disprove that $f(n) \in O(f(n)^2)$.

5. Using what you know prove or disprove that $f(n) + O(f(n)) \in \Theta(f(n))$.