## VORWEG GEHEN

Algorithms & Data S Janathan Rithmayor Homework # 5 Mat # 30001299 5.3) Write a differential pract for Ign = (nign) without having to use Stirling's formula. Proof, Show: Ign. Econlan Assume: 1g1 \* 2\* ... \* (n-1) \* n = c \* n lgn

Prove: 1g1 \* 2\* ... \* (n-1) \* n = lgn \* n \* n \* ... \* n \* n => 1 gn+n n n ... + n = lgn = plan (N times) =>nlgn < c\*nlgn It is true For c≥1 on & n≥1: Ign! zc\* nlgn -c\*n =>191 \* a \*3 \* ... \* (n-1) \* n = c \* n 19n - c \* n When n is even: 1g1 x 2 = 3 = ... x (n-1) = n = 1gn = ... x (n-1) x n =719=×110 (n-1) \* n = 19 (3+1) \* ... \* (n-1) \* n => lg (12+1) \* ... (n-1) \* n = lg 12 \* 1 \* ... \* 12 + 13 =719747 4.147 = 19 (2) = 1 19 => C \* n lgn - c \* n = cn \* (lgn-1)  $\Rightarrow \frac{n}{2}(\log n - 1) \geq c n \neq (\log n - 1)$ As such it is true for  $C \le \frac{1}{2}$  and  $n \ge 1$ 

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5.3 cont.) when n is odd:  $|g| + 2 + 3 + ... + (n-1) + n \ge |g| - \frac{1}{2} + ... + (n-1) + n$   $= 7 |g| - \frac{1}{2} + ... + (n-1) + n \ge |g| - \frac{1}{2} - \frac{1}{2} + ... + \frac{1}{2} - \frac{1}{2}$ => 127x192 = 2 152 =7 < x n | g n - c x n = c n x (| g n - 1)=7  $\frac{n}{2} | g \frac{n}{2} = \frac{n}{2} (| g n - 1)$ =7  $\frac{n}{2} (| g n - 1) = c n x | g n - 1)$ Thus true For CE a and n ≥1