C241 HW13 Mini

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Claim: For all $n \in \mathbb{N}$, if $n \geq 2$, then $3^n > 2^{n+1}$.

Proof. Choose some $n \in \mathbb{N}$ with $n \geq 2$.

Base Case (n = 2)

$3^2 = 9$

$2^{2+1} = 2^3 = 8$

$9 > 8$ so $3^2 > 2^{2+1}$

Induction Case (n > 2)

Suppose $3^k > 2^{k+1}$ for some $k \in \mathbb{N}$ with $k \geq 2$.

$3^{k+1} = 3 \cdot 3^k$

$2^{k+1+1} = 2 \cdot 2^{k+1}$

$3 \cdot 3^k > 3^k$

$2 \cdot 2^{k+1} > 2^{k+1}$

$3 > 2$ and $3^k > 2^{k+1}$ (by IH), so $3 \cdot 3^k > 2 \cdot 2^{k+1}$, or $3^{k+1} > 2^{k+1+1}$.

$\square$