$$5! \cdot 6 \cdot 7$$
$$1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 = 7!$$

Oct 8-9:57 AM

For all integers $n \geq 3$, $2n+1 < 2^n$

Basis: $n=3$

$2n+1 = 7$ $\quad 7<8$

$2^n = 8$

Suppose $2k+1 < 2^k$

show $2(k+1)+1 < 2^{k+1}$

$$\begin{aligned} 2(k+1)+1 &= 2k+2+1 \\ &= 2k+1+2 \\ &< 2^k+2 \quad \text{subst. Ind. Hyp.} \\ &< 2^k+2^k \\ &= 2\cdot 2^k \\ &= 2^{k+1} \end{aligned}$$

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Oct 8-10:02 AM

$2^n < (n+1)!$ for all integers $n \geq 2$

Basis: $n=2$

$2^2 = 4$ $\quad 4<6$

$(2+1)! = 3! = 6$

$(n+1)! = \prod_{i=1}^{n+1} i$

Suppose $2^k < (k+1)!$

Show $2^{k+1} < (k+2)!$

$$\begin{aligned} 2^{k+1} &= 2\cdot 2^k \\ &< 2(k+1)! \quad \text{S.I.H.} \end{aligned}$$

$2 < k+2$

$$\begin{aligned} &< (k+2)(k+1)! \\ &= (k+2)! \end{aligned}$$

Oct 8-10:16 AM

sequence

$a_1 = 2$

$a_m = 5\cdot a_{m-1}$ $\quad m \geq 2$

$a_1 = 2$

$a_2 = 5\cdot 2 = 10$

$a_3 = 5\cdot 10 = 50$

Show $a_n = 2\cdot 5^{n-1}$

$n \geq 1$

Basis: $n=1$

$a_1 = 2\cdot 5^0 = 2$ given

Suppose $a_k = 2\cdot 5^{k-1}$

Show $a_{k+1} = 2\cdot 5^{(k+1)-1} = 2\cdot 5^k$

$$\begin{aligned} a_{k+1} &= 5\cdot a_k \quad \text{def of } a \\ &= 5\cdot(2\cdot 5^{k-1}) \quad \text{S.I.H.} \\ &= 2\cdot 5^k \\ &= 2\cdot 5^k \end{aligned}$$

$2\cdot 5^{(k+1)-1}$

Oct 8-10:33 AM