Proof. 2.3.4c Prove $5|3^{3n+1}+2^{k+1}$.

Assume $n=0$.
We have $3^1+2^1=5$.
By Theorem 2.2a, we know $5|5$.
Assume $n=k$ holds.
We have

$$5|3^{3k+1}+2^{k+1}. \tag{1}$$

Assume $n=k+1$.
We have

$$\begin{aligned}
&3^{3(k+1)+1}+2^{(k+1)+1}\\
=&3^{3k+4}+2^{k+2}\\
=&3^3(3^{3k+1})+2(2^{k+1})\\
=&3^3(3^{3k+1})+2(2^{k+1})+2(3^{3k+1})-2(3^{3k+1})+3^3(2^{k+1})-3^3(2^{k+1})\\
=&(3^3+2)(3^{3k+1}+2^{k+1})-5(3^2*2^k+3^{3k})
\end{aligned}$$

We know $5|(3^3+2)(3^{3k+1}+2^{k+1})$ by (1) and $5|5$ by Theorem 2.2a.
By Theorem 2.2g this implies $5|3^{3(k+1)+1}+2^{(k+1)+1}$.
By FPMI this implies $5|3^{3n+1}+2^{k+1}\,\forall\, n\geq 0$. □