

Lesson 4 Problem 3 Solution

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Problem 3

When $n = 1$, $3^{2n+2} + 8n - 9 = 81 - 1 = 80$, which is divisible by 16. Using that as the base case for induction, assume $3^{2n+2} + 8n - 9$ is divisible by 16.

$$\begin{aligned}3^{2(n+1)+2} + 8(n+1) - 9 &= 9(3^{2n+2} + 8n - 9) - 72n + 8n + 81 + 8 - 9 \\ &= 9(3^{2n+2} + 8n - 9) - 64n + 80\end{aligned}$$

The first part is divisible by 16 due to the the induction hypothesis, and the second part is $-64n + 80 = 16(4n + 5)$, so also divisible by 16. Thus we complete the induction.