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CSCI-UA 310-001 PS4

$$9. \quad gh = ([2]x^2 + [3]x + [4])([3]x^2 + [2]x + [1]) \rightarrow$$

$$[2][3]x^4 + [2][2]x^3 + [2][1]x^2 + [3][3]x^3 + [3][2]x^2 + [3][1]x + [4][3]x^2 + [2][4]x + [4][1] \rightarrow$$

$$[1]x^4 + [4]x^3 + [2]x^2 + [4]x^3 + [1]x^2 + [3]x + [2]x^2 + [3]x + [4] \rightarrow$$

$$[1]x^4 + [3]x^3 + [0]x^2 + [1]x + [4] \rightarrow$$

$$[1]x^4 + [3]x^3 + [0]x^2 + [1]x + [4] \bmod x^3 + x + [1] \rightarrow$$

$$\begin{array}{r}
 \phantom{x^3 + x + [1]} \overline{x + [3]} \\
 x^3 + x + [1] \overline{) x^4 + [3]x^3 + [0]x^2 + x + [4]} \\
 \underline{-x^4 - [0]x^3 - x^2 - x} \phantom{+ [4]} \downarrow \\
 [3]x^3 + [4]x^2 + [0]x + [4] \\
 \underline{- [3]x^3 - [0]x^2 - [3]x - [3]} \\
 [4]x^2 + [2]x + [1] \\
 \checkmark \\
 gh \bmod f = [4]x^2 + [2]x + [1]
 \end{array}$$