The answer is correct!

Let $u = \sqrt[3]{2}$. In class we calculated that the inverse of $1 + 2u + 3u^2$ in $\mathbb{Q}[u]$ is

$$\frac{1}{801(9)}(9 + (27u + 450)(3u - 2)).$$

Of course, this answer may be cleaned up to become:

$$\boxed{\frac{1}{801(9)}(81u^2 + 1296u - 891).}$$

We now check our answer. We notice that

$$(1 + 2u + 3u^2)\frac{1}{801(9)}(81u^2 + 1296u - 891)$$

$$= \frac{1}{801(9)} \begin{cases} + \quad 81u^2 + 1296u - \quad 891 \\ +2592u^2 - 1782u + \quad 324 \\ -2673u^2 + \quad 486u + 7776 \end{cases} = \frac{7209}{801(9)} = 1. \checkmark$$