Step-1

Given that $n = 2$ and $n = 3$

$$\begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}^n, \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^n, \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^{-1}$$

$$\begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}^2 = \begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} 4 & 6 \\ 0 & 0 \end{pmatrix}}$$

$$\begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}^3 = \begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}^2\begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 4 & 6 \\ 0 & 0 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} 8 & 12 \\ 0 & 0 \end{pmatrix}}$$

Step-2

Continuation to the above,

$$\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^2 = \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} 4 & 9 \\ 0 & 1 \end{pmatrix}}$$

$$\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^3 = \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^2\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 4 & 9 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} 8 & 21 \\ 0 & 1 \end{pmatrix}}$$

Step-3

We know that if $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$$\Rightarrow A^{-1} = \frac{1}{ad-bc}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

$$\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^{-1} = \frac{1}{2-0}\begin{pmatrix} 1 & -3 \\ 0 & 2 \end{pmatrix}]$$

$$= \boxed{\begin{pmatrix} \frac{1}{2} & \frac{-3}{2} \\ 0 & 1 \end{pmatrix}}$$