

Step-1

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

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

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

$$\begin{aligned} \begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}^3 &= \begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix}^2 \begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix} \\ &= \begin{pmatrix} 4 & 6 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 0 & 0 \end{pmatrix} \\ &= \boxed{\begin{pmatrix} 8 & 12 \\ 0 & 0 \end{pmatrix}} \end{aligned}$$

Step-2

Continuation to the above,

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

$$\begin{aligned} \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^3 &= \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}^2 \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix} \\ &= \begin{pmatrix} 4 & 9 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix} \\ &= \boxed{\begin{pmatrix} 8 & 21 \\ 0 & 1 \end{pmatrix}} \end{aligned}$$

Step-3

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

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

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