

Calculating the inverse matrix of $\begin{pmatrix} 5 & \lambda \\ 2 & 4 \end{pmatrix}$

using the following schema

rows	matrix		unity matrix			
(1)	5	λ	1	0		
(2)	2	4	0	1		
(1)	5	λ	1	0	*	
(2a)	0	$4 - \frac{2}{5}\lambda$	$-\frac{2}{5}$	1	-2/5	(1)*(-2/5)+(2) -> (2a)
(1a)	5	0	$1 + \left(-\frac{2}{5}\right)\left(\frac{-\lambda}{4 - \frac{2}{5}\lambda}\right)$	$\frac{-\lambda}{4 - \frac{2}{5}\lambda}$	$\frac{-\lambda}{4 - \frac{2}{5}\lambda}$	(2a) * $\frac{-\lambda}{4 - \frac{2}{5}\lambda}$ +(1)->(1a)
(2a)	0	$4 - \frac{2}{5}\lambda$	$-\frac{2}{5}$	1	*	
(1b)	5	0	$\frac{10}{10 - \lambda}$	$\frac{-\lambda}{4 - \frac{2}{5}\lambda}$		Simplifying terms in (1a) -> (1b) (see below)
(2b)	0	$4 - \frac{2}{5}\lambda$	$-\frac{2}{5}$	1		
	unity matrix		inverse matrix			
(1c)	1	0	$\frac{2}{10 - \lambda}$	$\frac{-\lambda}{20 - 2\lambda}$		divide (1b) by 5 -> (1c)
(2c)	0	1	$\left(-\frac{2}{5}\right)\frac{1}{4 - \frac{2}{5}\lambda}$	$\frac{1}{4 - \frac{2}{5}\lambda}$		divide (2b) by $4 - \frac{2}{5}\lambda$ -> (2c)

The inverse matrix to $\begin{pmatrix} 5 & \lambda \\ 2 & 4 \end{pmatrix}$ is $\begin{pmatrix} \frac{2}{10 - \lambda} & -\frac{\lambda}{20 - 2\lambda} \\ -\frac{2}{20 - 2\lambda} & \frac{1}{20 - 2\lambda} \end{pmatrix}$

Additional Remarks

Simplifying terms

$$\begin{aligned}
 & 1 + \left(-\frac{2}{5}\right)\left(\frac{-\lambda}{4 - \frac{2}{5}\lambda}\right) \\
 &= 1 + \frac{2\lambda}{20 - 2\lambda} \\
 &= 1 + \frac{\lambda}{10 - \lambda} \\
 &= \frac{10}{10 - \lambda}
 \end{aligned}$$