Consider the following $A = \begin{bmatrix} -1 & 8 & 7 \\ 0 & -2 & 4 \end{bmatrix}$; $b = \begin{bmatrix} 9 \\ 6 \\ 0 \end{bmatrix}$; $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$;

1.

a:

$$\begin{aligned} Ab &= \begin{bmatrix} -1 & 8 & 7 \\ 0 & -2 & 4 \end{bmatrix} \begin{bmatrix} 9 \\ 6 \\ 0 \end{bmatrix} \\ &= \begin{bmatrix} -9+48 \\ -12 \end{bmatrix} \\ &= \begin{bmatrix} 39 \\ -12 \end{bmatrix} \end{aligned}$$

b:

$$\begin{aligned} AI^3b &= \begin{bmatrix} -1 & 8*7 \\ 0*-2 & 4 \end{bmatrix} I^3b \\ &= Ab = \begin{bmatrix} 39 \\ -12 \end{bmatrix} \end{aligned}$$

c:

$$\begin{aligned} x^T IA &= \begin{bmatrix} x_1 & x_2 \end{bmatrix} \begin{bmatrix} -1 & 8 & 7 \\ 0 & -2 & 4 \end{bmatrix} \\ &= \begin{bmatrix} -x_1 & 8x_1 - 2x_2 & 7x_1 + 4x_2 \end{bmatrix} \end{aligned}$$

d:

$x^T A = \begin{bmatrix} -x_1 & 8x_1 - 2x_2 & 7x_1 + 4x_2 \end{bmatrix}$

e, f:

No change.

2

$X = ([AB + (CD)^T][(EF)^{-1} + GH])^T$

$$CD = \begin{bmatrix} c_{11} & \dots & c_{1n} \\ \vdots & \ddots & \vdots \\ c_{n1} & \dots & c_{nn} \end{bmatrix} \begin{bmatrix} d_{11} & \dots & d_{1n} \\ \vdots & \ddots & \vdots \\ d_{n1} & \dots & d_{nn} \end{bmatrix} = \begin{bmatrix} c_{11}d_{11} + \ldots + c_{1n}d_{n1} & \dots & c_{1n}d_{1n} + \ldots + c_{1n}d_{nn} \\ \vdots & \ddots & \vdots \\ c_{n1}d_{11} + \ldots + c_{n1}d_{n1} & \dots & c_{n1}d_{1n} + \ldots + c_{nn}d_{nn} \end{bmatrix}$$