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5. Compute

$$\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} 1 \\ 3 \end{bmatrix} = \begin{bmatrix} 2+9 \\ 1+12 \end{bmatrix} = \begin{bmatrix} 11 \\ 13 \end{bmatrix}$$

6. Find scalars a_1 and a_2 so that $a_1 r + a_2 s = t$, where

$$r = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \quad s = \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \quad \text{and} \quad t = \begin{bmatrix} 1 \\ 4 \end{bmatrix}.$$

Solve $\left[\begin{array}{cc|c} 1 & 2 & 1 \\ 0 & 3 & 4 \end{array}\right]$ $R2 \mapsto \frac{1}{3} R_2$ $\left[\begin{array}{cc|c} 1 & 2 & 1 \\ 0 & 1 & \frac{4}{3} \end{array}\right]$ $R1 \mapsto R1 - 2R2$ $\left[\begin{array}{cc|c} 1 & 0 & -\frac{5}{3} \\ 0 & 1 & \frac{4}{3} \end{array}\right]$

So $a_1 = -\frac{5}{3}$
$a_2 = \frac{4}{3}$

7. Find x so that $x^{\mathrm{T}} a = 6$ and $x^{\mathrm{T}} b = 2$, where

$$x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \quad a = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \quad \text{and} \quad b = \begin{bmatrix} 3 \\ 4 \end{bmatrix}.$$

Solve $x_1 + 2x_2 = 6$
$3x_1 + 4x_2 = 2$

$\left[\begin{array}{cc|c} 1 & 2 & 6 \\ 3 & 4 & 2 \end{array}\right]$ $R2 \mapsto R2 - 3R1$ $\left[\begin{array}{cc|c} 1 & 2 & 6 \\ 0 & -2 & -16 \end{array}\right]$ $R2 \mapsto -\frac{1}{2} R_2$

$\left[\begin{array}{cc|c} 1 & 2 & 6 \\ 0 & 1 & 8 \end{array}\right]$ $R1 \mapsto R1 - 2R2$ $\left[\begin{array}{cc|c} 1 & 0 & -10 \\ 0 & 1 & 8 \end{array}\right]$

So $x = \begin{bmatrix} -10 \\ 8 \end{bmatrix}$