THERE ARE FIVE (5) PROBLEMS. THEY HAVE THE INDICATED VALUE.

SHOW YOUR WORK

DO NOT TEAR-OFF ANY PAGE

NO CALCULATORS     NO CELLS ETC.

ON YOUR DESK: ONLY test, pen, pencil, eraser.

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1. Solve the linear system:

\[
\begin{align*}
2x + 4y + 6z &= 2 \\
x + 3y + 4z &= 3 \\
x + 4y + 5z &= 4
\end{align*}
\]
2.

Find the basis of kernel and image of the linear transformation given by the matrix:

\[ A = \begin{pmatrix} 2 & 4 & 6 \\ 1 & 3 & 4 \\ 1 & 4 & 5 \end{pmatrix} \]

Is the vector (2, 3, 4) in the image of \( A \)?
3. Find the matrix representing each of the following linear transformations.
   (1) $T_1$: Rotation by $30^\circ$ clockwise on the plane.
   (2) $T_2$: Reflection with respect to the line $y = 2x$.
   (3) The composition $T_2 \circ T_1$. 
Let $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \end{pmatrix}$

(1) Calculate $AB$ and $BA$.
(2) Calculate $(AB)^{-1}$ and $(BA)^{-1}$ if they exist.
Scratch paper