

SCORE: ____ / 10 POINTS

NO CALCULATORS ALLOWED

Why did the chicken cross the road ?

Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 5 & 5 \\ -3 & -5 & 1 \end{bmatrix}$.

THIS MATRIX SHOULD
REQUIRE NO SWAPS
AND NO SCALES TO
FIND THE INVERSE.

SCORE: ____ / 6 POINTS

$$\begin{aligned} &\left[\begin{array}{ccc|ccc} 1 & 2 & 1 & 1 & 0 & 0 \\ 2 & 5 & 5 & 0 & 1 & 0 \\ -3 & -5 & 1 & 0 & 0 & 1 \end{array} \right] \begin{array}{l} R_2 + (-2)R_1 \\ R_3 + 3R_1 \end{array} \\ &\left[\begin{array}{ccc|ccc} 1 & 2 & 1 & 1 & 0 & 0 \\ 0 & 1 & 3 & -2 & 1 & 0 \\ 0 & 1 & 4 & 3 & 0 & 1 \end{array} \right] \begin{array}{l} \\ R_3 + (-1)R_2 \end{array} \\ &\left[\begin{array}{ccc|ccc} 1 & 2 & 1 & 1 & 0 & 0 \\ 0 & 1 & 3 & -2 & 1 & 0 \\ 0 & 0 & 1 & 5 & -1 & 1 \end{array} \right] \begin{array}{l} R_1 + (-1)R_3 \\ R_2 + (-3)R_3 \end{array} \\ &\left[\begin{array}{ccc|ccc} 1 & 2 & 0 & -4 & 1 & -1 \\ 0 & 1 & 0 & -17 & 4 & -3 \\ 0 & 0 & 1 & 5 & -1 & 1 \end{array} \right] \begin{array}{l} R_1 + (-2)R_2 \\ \end{array} \end{aligned}$$

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 30 & -7 & 5 \\ 0 & 1 & 0 & -17 & 4 & -3 \\ 0 & 0 & 1 & 5 & -1 & 1 \end{array} \right]$$

THE INVERSE IS

$$\begin{bmatrix} 30 & -7 & 5 \\ -17 & 4 & -3 \\ 5 & -1 & 1 \end{bmatrix}$$

She didn't - she was too busy looking at the interstitials.

Use an inverse matrix to solve the system $\begin{cases} 7x + 11y = 3 \\ 5x + 7y = 1 \end{cases}$

SCORE: ____ / 4 POINTS

$$\begin{aligned} \begin{bmatrix} x \\ y \end{bmatrix} &= \begin{bmatrix} 7 & 11 \\ 5 & 7 \end{bmatrix}^{-1} \begin{bmatrix} 3 \\ 1 \end{bmatrix} \\ &= \frac{1}{49-55} \begin{bmatrix} 7 & -11 \\ -5 & 7 \end{bmatrix} \begin{bmatrix} 3 \\ 1 \end{bmatrix} \\ &= \frac{1}{-6} \begin{bmatrix} 21 & -11 \\ -15 & 7 \end{bmatrix} \\ &= -\frac{1}{6} \begin{bmatrix} 10 \\ -8 \end{bmatrix} \\ &= \begin{bmatrix} -5/3 \\ 4/3 \end{bmatrix} \end{aligned}$$

$$\begin{bmatrix} x = -5/3 \\ y = 4/3 \end{bmatrix}$$